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ADDRESSES AND ORIGINAL ARTICLES

SOURCES OF HÆMOLYTIC STREPTOCOCCAL INFECTION OF WOUNDS IN WAR AND IN CIVIL LIFE

By Ronald Hare, M.D. Lond.

RESEARCH ASSOCIATE, CONNAUGHT LABORATORIES, UNIVERSITY OF TORONTO; LATE FIRST ASSISTANT, BERNHARD BARON MEMORIAL RESEARCH LABORATORIES, QUEEN CHARLOTTE'S HOSPITAL, LONDON

The official histories of the war 1914–18 show that the three most important bacteria infecting wounds were the *Clostridium tetani*, the gas-gangrene bacillus, and the hæmolytic streptococci. Tetanus was largely controlled by the early administration of antitoxin and gas-gangrene less efficiently by early excision, débridement, or amputation; but infections due to hæmolytic streptococci cannot be said to have been controlled at all. The source of the organisms in tetanus and gas-gangrene was undoubtedly the soil over which the armies fought, but that of the streptococci remained a mystery.

It is probable that the incidence of hæmolytic streptococcal infection will be much the same in the present conflict, and, although the deaths may be reduced by sulphanilamide, there are objections to the general use of this drug as a prophylactic. Since the last war, however, much has been learnt about the epidemiology of hæmolytic streptococcal infections, and their incidence may be reduced by other methods than chemotherapy.

DIFFERENTIATION OF STRAINS

The absence of any attempts to prevent these infections during the last war was partly due to the fact that streptococci are extremely widespread, and that no satisfactory means were available for the differentiation of pathogenic from non-pathogenic strains. Indeed, it was not until almost the end of the war that it was realised that most of the pathogenic strains are hæmolytic, and that the *Streptococcus viridans* and the so-called indifferent strains can be neglected.

Recent work has shown that the hæmolytic streptococci do not form one species (Lancefield 1933, Lancefield and Hare 1935, Hare 1935a). They are probably a family divisible into different groups or genera (now designated A to K) by a relatively simple precipitin test, morphology, and biochemical reactions. Only one of these groups (group A), the modern equivalent of the *Str. pyogenes* of Rosenbach, need be seriously considered as pathogenic to man. Many of the other groups (some of which are as strongly hæmolytic as group A) are more often found in human beings or in their surroundings but are seldom, if ever, pathogenic.

Griffith (1926, 1927, 1934), Lancefield (1928), and many others have also shown that group A may be further subdivided by agglutination and precipitin reactions into at least thirty different types. Thus we can now define a potentially pathogenic strain among the ruck of non-pathogens and often differentiate actual from possible sources of infection.

SOURCES OF PATHOGENIC STRAINS

There are three possible sources of potentially pathogenic strains—namely, pre-existing infections in the neighbourhood; the patient or his attendants; and infected air, clothing, instruments, dressings, or food.

Pre-existing infections in the neighbourhood.—The first of these are infections of the respiratory tract not recognisable clinically as tonsillitis or septic sore-throat but more resembling influenza or the common cold. Glover and Griffith (1931), Gordon et al. (1935), and Bradley (1938) have shown that hæmolytic streptococci may be isolated from many of them, and they are possibly due either directly to these organisms or to synergism between them and an unknown virus. Here the illness may be so mild that the patient remains on duty. The same applies to trivial infections of the nail bed and surrounding tissues, where pathogenic organisms, such as hæmolytic streptococci, may be unsuspected.

Regard must also be paid to hæmolytic streptococcal infections of wounds in patients in the same ward. A high proportion of wounds in the last war were certainly infected, but the lack of a satisfactory method of classifying streptococci makes it difficult to give any idea of the incidence.

Weinberg and Seguin (1917) found streptococci in 36 of 91 wounds, Ivens (1916) cultivated "virulent" streptococci from 59 out of 464 wounds, and Bunce, Berlin, and Lawrence (1919) isolated hæmolytic streptococci from 236 of 985 wounds in a base hospital. It is not, however, clear whether the organisms were merely saprophytic or actually causing clinical signs and symptoms. The report of the medical department of the U.S. Army in the last war (1929) mentions that "a combination of hæmolytic streptococci and *Staphylococcus aureus* was the most prominent of all the bacterial associations in wounds at Base Hospital No. 15. This association was particularly prominent in fatal wounds." Fleming and Porteous (1919), working at Étaples, say that hæmolytic streptococci were "responsible for almost all the severe septic complications of these wounds" and found them in over 90 per cent. of cases of compound fracture of the femur which had been at the base for more than a week.

That the great majority of strains from infections in man belong to the serological group A is well illustrated in table I, which gives the results of workers who have employed this method of classification. Only two other groups (C and G) approach group A in importance as pathogenic to man, but they are far outnumbered by the strains of group A. The number of strains available for classification from wounds is small, but these too belong to the all-important group A. It may therefore be assumed that the bulk of wound infections will be due to strains of this group.

The patient or his attendants.—Many people apparently in normal health carry hæmolytic streptococci somewhere about their persons. The following are the known sites and classification of the organisms:—

Skin: Flehme (1920) and Haxthausen (1927) described streptococci as occurring often on the skin but made no attempt to classify the organisms. The official History of the Great War (1923) attributes to Levaditi and Delrez (1917) the statement that 12–62 per cent. of soldiers in the trenches had *Str. pyogenes* (sic) on the skin. Actually they made no such statement, nor did they show that the organisms they isolated were hæmolytic or bore any resemblance to *Str. pyogenes*. Schachter (1918), however, did find hæmolytic streptococci on the skin of 8 out of 89 dispensary patients but could not find them on the skin of 38 people of higher social status; Pilot and Brams (1923) found them in the preputial sac of 9 out of 100 men.

The question has been studied in detail by Colebrook, Maxted, and Johns (1935), employing selective

methods of cultivation and sampling skin from different sites. Their results are given in table II. Although hæmolytic streptococci were isolated from the skin of all the areas examined, the great majority were not members of group A. The only exception was the hands, from which group-A strains were isolated in 3·8 per cent. of instances. These organisms may have been derived from the nasopharynx, because 5 out of the 7 people harbouring them had "colds" when the samples were taken. Throat swabs were not examined. Thus it seems that group-A strains are not found on the skin of most of the body, even when, as in the perineum, it is in contact with fæces, but that they may occur on the hands.

Nasopharynx: from the many investigations carried out it seems that about 20 per cent. of the population of the temperate zones carry hæmolytic streptococci, but that most of the strains do not belong to group A. Table III gives the results of investigations in different parts of the world. Although 18·5 per cent. of the people were carriers, only about 7 per cent. of the total number of persons examined carried group-A strains. Thus, although hæmolytic streptococci are relatively common in the nasopharynx, only about a third of the strains are members of group A and therefore potentially pathogenic. Nevertheless a carrier-rate of nearly 7 per cent. for these strains is formidable.

How long a person may remain a carrier has not yet been worked out, but there is evidence that the chances of becoming a carrier are high. Long and Bliss (1938) found that 73 per cent., and Fraser (1939) 58 per cent., of people periodically examined were carriers at some time or other. These strains were not serologically examined, but Foote et al. (1936) found that 17 out of 85 people examined weekly for three months became carriers of group-A strains. There is evidence that higher carrier-rates are usual in communities where there has been much infection (Arnold 1919–20, Bryce and Tewsley 1938, Glover and Griffith 1931, Stein 1933, Gordon et al. 1935, Fraser 1939), in the winter (Paine 1935, Ministry of Health 1930, Meleney 1927, Bourn, Carpenter, and McComb 1933), and where there is overcrowding (Coburn and Pauli 1932).

TABLE I—CLASSIFICATION OF STRAINS FROM INFECTIONS IN MAN

Source and disease	No. of strains	Group									Unclassified
		A	B	C	D	E	F	G	H	K	
Throat—											
Scarlet fever	594	591	..	1	..	..	..	..	..	..	2
Tonsillitis	37	37	..	..	..	..	..	..	..	..	..
Septic sore-throat	22	22	..	..	..	..	..	..	..	..	..
Sore-throat	28	28	..	..	..	..	..	..	..	..	..
Skin—											
Erysipelas	36	32	..	4	..	..	..	..	..	..	..
Miscellaneous	4	4	..	..	..	..	..	..	..	..	..
Uterus—											
Puerperal infection	381	348	3	12	..	..	..	10	..	..	8
Auditory system—											
Otitis media	22	22	..	..	..	..	..	..	..	..	..
Mastoid	16	16	..	..	..	..	..	..	..	..	..
C.N.S.—											
Meningitis	30	27	3	..	..	..	..	..	..	..	..
Lymphatic system—											
Lymphangitis	16	14	..	..	..	..	..	1	..	..	1
Lymphadenitis	7	5	..	..	1	..	..	1	..	..	..
Wounds	18	18	..	..	..	..	..	..	..	..	..
Burns	4	4	..	..	..	..	..	..	..	..	..
Miscellaneous	161	139	3	7	..	..	5	2	..	..	5
Totals	1376	1307	9	24	1	0	5	14	0	0	16

This table is compiled from the results of Lancefield (1933), Edwards (1934), Lancefield and Hare (1935), Hare (1935b), Hare and Maxted (1935), Congdon (1935), Otero and Lebron (1936), Colebrook and Purdie (1937), Kodama et al. (1937, 1938) Shaw (1937), Butler (1938), Plummer (1939), and Reid and Browne (1939).

TABLE II—HÆMOLYTIC STREPTOCOCCI PRESENT ON HUMAN SKIN

(From Colebrook, Maxted, and Johns 1935)

Site	Persons studied	Strains of hæmolytic streptococci	Group									Unclassified
			A	B	C	D	E	F	G	I	K	
Hands	181	18	7	..	1	..	..	1	1	3	..	5
Back	14	2	..	..	1	..	..	..	..	..	..	1
Perianal region	160	11	..	..	1	10	..	..	..	..	..	..

Infected air, soil, clothing, instruments and dressings, and food.—The air of the open country has not been examined, but it is very unlikely ever to be much infected with hæmolytic streptococci. Williams (1932) failed to isolate them in the air of New York City, but Buchbinder et al. (1938) found them in the streets and public buildings. Some of the strains belonged to group A. In hospitals they are not usually found in the air of medical wards but are undoubtedly present in that of wards for infected cases. Cruickshank (1935) demonstrated them in the atmosphere of wards in which infected burns were being nursed; White (1936), and Cruickshank and Godber (1939) in wards housing puerperal infections; Friedemann and Deicher (1926), Vas (1926), and Brown and Allison (1937) in scarlet-fever wards; and Keevil and Camps (1937) in wards with infections of the respiratory tract. The contamination of the air was heavy in all these instances, and the organisms

Fæces: hæmolytic streptococci are comparatively common in the fæces. It appears from four investigations (Broadhurst 1915, Oppenheim 1920, Wordley 1922, Hare and Maxted 1935) that 52 out of 219 people examined had them in the fæces, making the high carrier-rate of 23·7 per cent. Most of these were probably not group-A strains. The results of two investigations are given in table IV. Group-A strains may, however, be present in the fæces of patients with a clinical infection of the nasopharynx (Hare and Maxted 1935, Kuroi and Takemori 1933). It thus appears to be improbable that, even if the wound is extensively contaminated by fæces, infection by group-A strains can take place, unless there is a coincident infection of the throat.

TABLE III—CLASSIFICATION OF HÆMOLYTIC STREPTOCOCCI OF HUMAN NASOPHARYNX

Throats examined	Strains of hæmolytic streptococci	Group									Unclassified	Place	Authors
		A	B	C	D	E	F	G	H	K			
750*	150	63	5	15	..	..	12	13	25	8	9	London	Hare (1935a)
200	59	23	9	16	1	..	..	6	2	..	2	Edinburgh	Green (1938)
621	101	38	..	..	..	..	63	..	..	..	..	U.S.A.	Frisch (1938)
410	106	40	1	30	..	..	7	28	..	..	..	Japan	Kodama et al. (1938)
788	78	28	..	23	..	..	..	27	..	..	..	Hong-Kong	Davis and Guzdar (1936)
218	55	14	..	..	..	..	41	..	..	..	..	Melbourne	Keogh and Kelsey (1939)
115	25	10	..	..	..	..	15	..	..	..	..	"	Bryce and Tewsley (1938)
3102	574	216	15	84	1	0	19	74	27	8	11	—	—

* Calculated.

were often shown to be members of group A and of the same types as those causing infections in the wards.

Dirt and dust: there are no records of the examination of the dirt or dust of the battlefields. Eleven specimens of soil from areas in Toronto likely to be contaminated by human beings did not yield any hæmolytic streptococci. It is difficult to imagine how soil could become contaminated by group-A strains, or how the organisms could survive for long. On the other hand, the dust of wards in which infected cases (scarlet fever, puerperal fever) are being nursed is almost always infected.

Fleming (1915) noted the presence of unidentified streptococci on the clothing of wounded men. I lately examined the lower part of the trousers of 25 men and found no hæmolytic streptococci, although *Str. viridans* was found on 1 person. Infection of clothing with group-A strains must therefore be unusual, except in a grossly infected atmosphere, such as a scarlet-fever ward. But the pocket handkerchief, and the pocket which contains it, of men who are clinically infected or are throat carriers may be contaminated.

Although hæmolytic streptococci are more susceptible to heat than most pathogenic organisms, inadequate sterilisation of instruments and dressings may allow them to survive and lead to contamination of wounds. Sterilisation by such antiseptics as lysol

TABLE IV—CLASSIFICATION OF HÆMOLYTIC STREPTOCOCCI OF HUMAN FÆCES

Persons	Strains	Group									Unclassified	Authors
		A	B	C	D	E	F	G	H	K		
100	32	..	..	..	13	..	5	2	8	..	4	Hare and Maxted (1935)
—	109	..	6	1	92	..	1	9	..	..	..	Smith and Sherman (1938)

or phenol takes longer than is generally supposed (Colebrook and Maxted 1933), and under stress the time allowed might be cut dangerously short.

Except milk, which is occasionally infected with a group-A strain, food is not likely to contain pathogenic hæmolytic streptococci.

The possible sources from which the organisms infecting war (or other) wounds may be derived are given in table V.

TABLE V—DISTRIBUTION OF HÆMOLYTIC STREPTOCOCCI

Site	Presence of hæmolytic streptococci	Presence of group-A strains
Infection	—	95·0%
Skin	All sites	Only hands: 3·8%
Throat	18·5%	6·9%
Fæces	23·7%	None
Air—		
Country	Probably never	—
Near infection ..	100%	100%
Soil	Probably never	—
Clothing	Probably never, except handkerchiefs	—
Instruments, &c. ..	Not known	—
Food	Only milk	Very rarely

POSSIBLE MODES OF INFECTION OF WOUNDS

There is no essential difference between war-wounds and those of everyday life in peace-time, but I will here discuss the special case of wounds in the battle zone.

We will assume that a soldier has just had a severe wound of the thigh with a compound fracture of the femur. The wound contains pieces of clothing, dirt, and possibly fæces, but nevertheless hæmolytic streptococci are not likely to be present. He is picked up by stretcher-bearers, who dress the wound and take him to the regimental aid post. Here a Thomas splint and another dressing are probably applied. He is then evacuated either to the advanced dressing-station of the field ambulance or direct to the field ambulance itself, where more dressing will almost certainly be done. Thence he is shipped to the casualty clearing station (C.C.S.), reaching it usually within sixteen hours of being wounded.

In the last war it was found that cultures of wounds taken on arrival at the C.C.S. showed hæmolytic streptococci in 12–15 per cent. (Stokes and Tytler 1918–19, Fleming and Porteous 1919). Most of these were probably group-A strains, because Stokes and Tytler mentioned that 19 out of 20 wounds containing these organisms subsequently suppurated when treated by primary excision. Now, before his arrival at the C.C.S. our man can have had little or no contact with frankly infected patients; hence the infection can hardly have been due to case-to-case transfer and was probably not derived from the air, the skin, the clothing, the soil, or the fæces. But the personnel of the regimental aid post consists of 1 medical officer and 16 other ranks, that of the field ambulance of 10 medical officers, 226 other ranks, and 150 patients, and that of the motor ambulance convoy, which removes the man to the C.C.S., of 2 medical officers and 28 other ranks (not counting the 6 officers and 184 men of the transport wing who have little contact with him). Thus, up to the time of his arrival at the C.C.S. he has been through the hands of units containing 13 medical officers, 270 other ranks, and 150 patients, totalling 333 people.

If about 7 per cent. of normal people are nasopharyngeal carriers of group-A strains, he has run the gauntlet of 23 such carriers. Similarly, if 3·8 per cent. of apparently normal people carry these strains on their hands, he has encountered 12 hand carriers. If some of the personnel had an atypical infection of the nasopharynx or an infection of the hand, the possibility of infection would be even higher. It may be argued that infection of wounds by clinically uninfected carriers is an impossibility. This is not a valid argument.

The part played by the "healthy" throat carrier in puerperal infection has been demonstrated by Smith (1931, 1933), in operation wounds by Meleney and Stevens (1926), in scarlet fever by Gordon et al. (1935), in tonsillitis and other respiratory infections by Glover and Griffith (1931). Bradley (1938), and Keevil and Camps (1937) have traced the dissemination of infection in hospitals by clinically uninfected throat carriers among the staff or patients. The work of Allison and Brown (1937) on cross-infection in scarlet-fever wards and of Okell and Elliott (1936) in otorhinolaryngological wards points in the same direction.

There is no reason why wounds in war or civil life should not often be infected from the same sources. The possibility that the organisms might be derived from the patient's own throat or hands must not, however, be forgotten. In wounds of the face or hands this hazard will undoubtedly be much greater than in the lower trunk and legs.

The chances of infection at the C.C.S. are much the same as during the journey down, and, even if

our soldier has up to then escaped contact with a carrier, the new set of carriers may still infect him. At the base hospital, where he stays until his wound heals, he will have to encounter more carriers and also a new hazard in his neighbours in the ward whose wounds have already suppurated. The frequency with which these wounds are infected has already been discussed. That they infect the air about them seems highly probable in view of the findings with burns and puerperal infections. Airborne infection of clean cases from other wounds in the vicinity has been described by Cruickshank and Godber (1939). That such infection took place in the last war is almost proved by the demonstration by Fleming in the History of the Great War that strains from any of the cases in his wards were all agglutinated to titre by sera made from any one of them. Some of these infections may have been transported by instruments or hands.

Thus all the evidence suggests that many infections of wounds at the base were hospital infections. This was to some extent realised during the last war, for Fleming and Porteous (1919) wrote: "When the patient had been kept at the C.C.S. for more than three or four days, *Str. pyogenes* was present in almost every case. . . . Where, however, the patient had been sent straight on to the base after excision of the wound we found *Str. pyogenes* in only 15 out of 75 cases. . . . It is to be noted therefore that on arrival at the C.C.S. 15 per cent. of the men were infected with *Str. pyogenes*; on arrival at the base (when the cases went straight after operation) 20 per cent. were infected, but after a stay of a week at the base over 90 per cent. were found to have *Str. pyogenes* in their wounds."

Wounds sustained by civilians in air-raids will probably become infected in much the same way. The journey to the base hospital may be shorter and the danger of infection during evacuation correspondingly less; but the chance of infection at the civilian base hospitals will be as great if not greater than that at the base hospitals in France during the last war.

DISCUSSION

The evidence suggests that the hæmolytic streptococci which infect wounds before their arrival at the C.C.S. are in most cases exogenous and probably derived from the nasopharynx of someone in attendance. Wounds may be infected from the same source at the base, but many are probably infected from neighbouring patients.

Two lines of attack should be employed to reduce the incidence of these infections. The first should be directed to the elimination of transfer of organisms from the nasopharynx or the hands of every person, from regimental aid post down to base hospital, who may attend the wounds. The ideal obviously should be that every person who attends the wound should be efficiently masked and should wear sterile gloves. At least masks might be worn by all attendants. Sterile rubber gloves in the forward areas may be impracticable, but gloves moistened with an adequate antiseptic will do as well. If the bare hands must be used, they should be carefully prepared, but Colebrook and Maxted (1933) showed that with the commonly employed antiseptic solutions, such as a 1 in 160 solution of lysol or 1 in 1000 perchloride of mercury, sterilisation of hands contaminated with hæmolytic streptococci is not easy.

The second line of attack consists in the segregation of infected cases. No-one would think of nursing a woman with puerperal infection in the same ward as uninfected cases, but this elementary precaution is more often than not neglected in surgical practice even in peace-time.

A medical officer conversant with the modern methods of isolation and classification of the hæmolytic streptococci on the staff of base hospitals would undoubtedly be of assistance, but his recommendations about isolation must be acted on by the medical officers in charge of the cases. The most efficient prophylactic measures in the forward areas may be completely nullified by their non-adoption at the base.

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EFFECTS OF STORAGE ON HUMAN ERYTHROCYTES

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IT is to be expected that a system like blood, consisting of complex organic substances liable to degradation and containing active ferments will show many changes under the conditions of storage necessitated by modern warfare. Thus, glycolysis rapidly takes place in shed blood, and hæmolysis appears after several weeks. This paper is concerned with changes in cell volume of the erythrocytes and their influence on hæmolysis, and also with alterations in the amounts of ammonia and phosphorus in the blood.

Cell Volume and Hæmolysis

Methods.—Cell volume was measured in special hæmatocrit tubes about 5 cm. long, graduated in 0·001 c.cm. up to 0·05 c.cm. The mean cell volume was calculated from the volume of red cells relative to that of whole blood (hæmatocrit volume) and the erythrocyte-count. In carrying out cell-counts on stored blood it is essential that the blood be diluted with clear citrate-plasma and not with normal saline, because salt solutions, even though isotonic with fresh erythrocytes, are hæmolytic to stored cells (Maizels and Whittaker 1939).

When stored blood had partially hæmolysed, the upper face of the centrifuged erythrocyte column was "woolly" and not clear-cut. In this event the "woolly" layer was removed with a capillary pipette, the tube recentrifuged, the new column of packed cells measured, and the erythrocytes taken up in 5 c.cm. of citrate plasma. A cell-count was carried out in the ordinary way, and from these data the mean cell volume was calculated.

Besides mean cell volume, the colour-index and natural hæmolysis developing during storage were measured by methods described elsewhere (Maizels and Whittaker 1939), and the additional hæmolysis produced by suspending blood-cells in 0·8 and 0·9 per cent. solutions of sodium chloride. The results for bloods of various ages are shown in table I, and in experiments 12a, 13a, and 14a the findings when dextrin is added to stored blood are also set out.

Certain criticisms may be directed against these methods. It may be objected that centrifuging distorts or damages cells; such damage, however, is slight, and measurements made on different bloods by the same technique give definitely comparable results. It may also be objected that removal of the upper part of the centrifuged column of erythrocytes, when partial hæmolysis is present, makes the specimen not completely representative. This criticism only applies to experiments 12, 13, and 14, and here the cell volume merely indicates the type of change.

In most of the above experiments 2 parts of fresh blood were mixed with 1 part of a solution containing sodium citrate 1·05 per cent. and sodium chloride 0·85 per cent. and stored at 2°–4° C. Table I confirms our previous observations (Maizels and Whittaker 1939): there is a gradual increase of spontaneous hæmolysis and a rise in colour-index corresponding to cell destruction with age, and the great increase of hæmolysis when the bloods are mixed with normal saline is also seen. The superior preservation of blood when dextrin (to 3 per cent.) is added is also shown in experiments 12a, 13a, and 14a as compared with the control experiments 12, 13, and 14. Besides these observations data are given for cell volumes at different stages of storage. On mixing fresh blood with the standard citrate saline there is a shrinkage in volume from about 86 μ^3 to about 80 μ^3. Thereafter the cells begin to swell as they are permeated by the external salt solution; at the end of a week their volume is again about normal, and after four weeks they have increased by 30–40 per cent. When dextrin is added, the swelling is much less evident than in the corresponding control experiment, increase after four weeks' storage being less than 20 per cent.

TABLE I—CELL, VOLUME, COLOUR-INDEX, AND HÆMOLYSIS IN STORED BLOOD

Expt.	Time	Colour-index	Mean cell volume	Hæmolysis		
				Spontaneous	In NaCl 0·9%	In NaCl 0·8%
1	1 hour	0·93	79	0	0	0
2	6 hours	0·96	82	0	0	0
3	6 ,,	0·95	83	0	0	0
4	5 days	0·97	85	0	0	1
5	7 ,,	1·03	90	0	0	3
6	7 ,,	0·97	98	0	0	2
7	11 ,,	1·05	94	1·0	1·5	3
8	14 ,,	0·93	102	3·2	8·0	30
9	14 ,,	0·94	104	2·8	12·0	20
10	20 ,,	0·97	107	3·5	20·0	85
11	20 ,,	1·08	112	3·0	15·0	88
12	32 ,,	1·17	113	20·0	70·0	80
12a	32 ,,	1·03	100	1·1	22·0	60
13	33 ,,	1·26	102	38·0	80·0	90
13a	33 ,,	0·92	94	1·7	30·0	85
14	34 ,,	1·32	118	40·0	80·0	95
14a	34 ,,	0·97	96	1·8	40·0	85

a = Dextrin added.

DISCUSSION

Swelling of cells is the result of an inflow of water. Water can only flow into the cell from either an isotonic or a hypertonic external medium if there is a corresponding inflow of salts. The fresh human erythrocyte is impermeable to cations; and, since the anions of a salt cannot diffuse alone, the intact cell is, for practical purposes, impermeable to cations and salts. Water alone can then only flow into a cell if the external medium is hypotonic. But, since under conditions of storage cells swell in a hypertonic medium, increase in size must be due to a simultaneous inflow of salts and water. If this evidence of loss of the cell's normal impermeability to base is accepted, it follows that salts will enter the stored erythrocyte until the concentrations and osmotic pressures of the salts within and without the erythrocyte are equal. But, when this has taken place, there are still two other substances to be considered in the osmotic balance—plasma proteins and cell hæmoglobin. The osmotic pressure of the hæmoglobin is by far the greater; hence the unbalanced hæmoglobin gradually attracts water to the cell, causing it to swell and finally to burst. It is thought that this gradual equalisation of salt concentration within and without the erythrocyte, together with the unbalanced excess of osmotic pressure due to hæmoglobin, is an important factor in cell hæmolysis; possibly softening and disintegration of the cell membrane may be another.

The effects of adding dextrin in preserving blood are somewhat difficult to analyse. Gwynn and Alsever (1939) have shown that the addition of glucose in a final concentration of 1 per cent. to citrated blood enhances its keeping properties. In our work dextrin was preferred because, owing to its high molecular weight, it could be added in larger

concentration, and because it was thought that it might be broken down sufficiently slowly to ensure an even distribution of glucose over a long time. Dextrin and glucose might act in one of the following ways :—

(1) As non-penetrating or slowly penetrating substances they might oppose an osmotic pressure to that of the hæmoglobin inside the cells.

(2) By maintaining cell metabolism they might delay loss of impermeability of the cell membrane to salts. The metabolism of mature erythrocytes is very small but not immeasurable. Dextrin and dextrose may well act as a source of cell nutrition, helping to prevent physical or chemical changes in the cell wall. Evidence that something of this kind takes place may be derived from the observation that cells stored with dextrin swell much less than those stored without.

(3) Carbohydrates might maintain the integrity of the cell membrane by some physical process of surface action. In this connexion it may be shown that glucose has an immediate effect in increasing the extensibility of the cell surface. By a modified hæmatocrit technique, changes of cell volume in different solutions may be measured (Maizels and Whittaker 1939). If erythrocytes are placed in hypotonic salt solutions they swell. In a 0·49 per cent. solution of sodium chloride the increase is very nearly 60 per cent. In a 0·48 per cent. solution of sodium chloride swelling is also 60 per cent., but now 2 per cent. of hæmolysis is present. It may therefore be said that for this particular blood the maximal increase in volume obtainable in a solution of sodium chloride without hæmolysis is 60 per cent.

If, however, glucose 1 per cent. is added to the salt solution, hæmolysis is just evident in a 0·4 per cent. solution of sodium chloride, and the critical volume is then 183 per cent. It therefore follows that cells can attain a much larger critical volume and tolerate a much larger inflow of water without hæmolysis when glucose is present in a saline solution than when it is absent. For this reason, stored cells which have lost their impermeability to salts are likely to survive much longer when glucose is added to the anticoagulant citrate-saline solution. The exact mode of action by which the surface area is increased is obscure. Possibly glucose molecules are inserted into the cell membrane, which is only a few molecules thick.

When dextrin is added to salt solution, the critical subhæmolytic swelling is only 68 per cent., and this may well be due to glucose present in the dextrin (5·5 per cent.) and not to the dextrin itself. This last observation suggests that the value of adding dextrin to blood lies in the gradual liberation of glucose and not in the dextrin itself.

If sucrose is added to salt solution, the critical subhæmolytic swelling is only 72 per cent. This suggests that linkage of monosaccharide molecules decreases their surface effect and would probably make them less efficient agents in the preservation of blood.

Ammonia

Ammonia has been estimated by nesslerisation of a sodium tungstate-sulphuric acid filtrate of citrated blood. According to Benedict and Nash (1926) normal blood contains less than 0·3 mg. of ammonia per 100 c.cm., an amount which is hardly detectable except by the most careful methods. In stored blood it is slightly increased, but even after seven weeks' storage at 2° C. the level is only about 5 mg. per 100 c.cm., the figures in three experiments being 4·8, 5·1, and 5·2 mg. It is perhaps remarkable that so little breakdown of nitrogenous compounds has taken place.

Phosphorus

In view of the well-known hydrolysis of the organic phosphates of cells by phosphatases it might be expected that both cells and plasma of stored blood would be very rich in inorganic phosphate. To investigate this matter the following method was used:—

Stored blood containing about a third by volume of citrate-saline (Harington and Miles 1939) was mixed gently but thoroughly and divided into two portions. Each was kept for 1½ hours, one at 2° C. and the other at 37° C. In the second specimen it was possible to measure the effects of a brief period of warmth on blood that had undergone a period of storage at low temperature. The bloods were then centrifuged for 15 min. at 3000 r.p.m., and the cells and citrate-plasma were separated. The percentage of hæmolysis was determined from the amount of hæmoglobin present in the plasma. Total acid-soluble phosphorus and inorganic phosphorus were measured by the methods described by Martland and Robison (1926),

TABLE II—PHOSPHORUS IN STORED BLOOD

Expt.	(a) Storage at 2° C. (days) + (b) Incubation at 37° C. (hours)	Hæmolysis (per cent.)	Phosphorus (mg. per 100 c.cm.)			
			Inorganic		Organic (acid soluble)	
			Plasma	Cells	Plasma	Cells
	(a) (b)		*Series* 1			
1	1 + 0	0	2·20	1·42	—	—
	1 + 1½	0	3·12	3·10	—	—
2	1 + 0	0	2·18	1·46	− 0·04	54·94
	1 + 1½	0	3·07	5·25	− 0·15	47·95
3	1 + 0	0	1·52	1·54	− 0·04	51·06
	1 + 1½		1·76	2·73	− 0·03	50·07
4	6 + 0	0	1·84	2·34	—	—
	6 + 1½	0	2·79	5·80	—	—
5	6 + 0	1	2·75	3·12	+ 0·17	50·08
	6 + 1½	1	4·06	6·93	− 0·28	43·07
6	7 + 0	½	2·40	8·64	− 0·16	39·36
	7 + 1½	½	5·02	10·56	0	32·64
7	14 + 0	3	3·90	21·20	—	—
	14 + 1½	3	10·10	20·4	—	—
8	14 + 0	3	3·72	23·4	—	—
	14 + 1½	3	9·01	16·4	—	—
9	15 + 0	0	3·26	29·7	+ 0·49	12·80
	15 + 1½	0	7·19	20·0	+ 0·75	13·0
10	15 + 0	1	2·84	31·2	+ 0·36	12·5
	15 + 1½	1	9·32	20·7	+ 1·01	11·9
11	18 + 0	2	2·70	36·0	—	—
	18 + 1½	2	8·77	30·6	—	—
12	20 + 0	0	4·04	29·5	—	—
	20 + 1½	0	5·46	26·6	—	—
13	21 + 0	2	3·53	20·4	—	—
	21 + 1½	2	5·87	17·2	—	—
14	21 + 0	2	4·54	33·6	+ 0·98	6·9
	21 + 1½	2	8·59	24·6	+ 0·29	6·8
15	21 + 0	2	4·84	30·7	+ 0·62	6·6
	21 + 1½	2	10·42	23·0	0	4·8
16	26 + 0	4	4·42	25·8	—	—
	26 + 1½	4	9·94	18·0	—	—
17	26 + 0	3	5·06	34·4	—	—
	26 + 1½	3	7·13	28·1	—	—
18	26 + 0	10	9·38	32·9	− 0·28	6·1
	26 + 1½	10	13·24	26·9	− 0·07	4·2
19	26 + 0	11	10·41	26·6	+ 0·83	4·9
	26 + 1½	11	12·92	23·0	+ 0·96	5·7
20	45 + 0	8	7·9	32·2	+ 0·9	1·5
	45 + 1½	8	10·2	27·4	+ 2·4	2·3
			Series 2			
1	7 + 0	0	2·14	3·68	+ 0·08	39·92
	14 + 0	3	2·74	19·6	+ 0·25	20·7
2	7 + 0	1	2·91	2·72	− 0·13	43·7
	14 + 0	5	3·42	18·2	+ 0·26	24·5

and the difference between these two figures gave the amount of acid-soluble organic phosphates.

In the interpretation of data for the citrate plasma it must be remembered that in undiluted normal blood the cells and plasma are about equal in volume, whereas in the diluted stored blood the volume of the citrate-saline plasma is about twice that of the cells; thus inorganic phosphorus is about 3 mg. per 100 c.cm. of normal fresh plasma and about 1·5 mg. per 100 c.cm. of fresh citrate-saline plasma. The results obtained are summarised in table II, series 1. After 24 hours' storage (during the first few hours of which the blood is cooling from 37° to 2° C.) very little hydrolysis of cell phosphate takes place, and practically no phosphate diffuses out of the erythrocytes into the citrate-saline plasma, the figure for inorganic phosphate being practically normal.

After a week's storage the amount of inorganic phosphorus in the citrate plasma has risen about 50 per cent., and at the end of a fortnight it is roughly doubled. In contrast with these small absolute increases the inorganic phosphorus of the cells has increased ten or twenty times. In spite of the extensive hydrolysis of organic cell phosphate, only some 10 per cent. had diffused into the citrate plasma as inorganic phosphorus; hence the relative content of inorganic phosphorus in cells and plasma is about 5 to 1. When it is recalled that only about 70 per cent. of the erythrocyte substance is water, the relative concentrations are as 7 to 1.

By the end of four weeks about 80 per cent. of cell phosphate is in the inorganic form. In experiments 16 and 17, where the blood had been carefully stored, only 3 per cent. of hæmolysis was present, and only 20 per cent. of cell phosphate had diffused into the plasma. The bloods of experiments 18 and 19 had been distributed by road to a hospital and were examined after their return. Here hæmolysis was well developed, and loss of phosphate from the cells amounted to about 40 per cent. of the total; but even in these blood cells phosphorus was about three times as great as plasma phosphorus. After six weeks' careful storage 90 per cent. of cell phosphorus is inorganic, while 30 per cent. of the total phosphorus has reached the plasma and 70 per cent. remains in the cells. It is probable that any phosphate diffusing out of cells is in the inorganic form, for the figures for total and inorganic plasma phosphorus are (within the limits of experimental error) similar, the difference being sometimes slightly negative and at others slightly positive. In one or two instances it is possible that there has been some leakage of organic phosphorus, perhaps in association with hæmolysis and loss of cell substance.

In view of the slow decomposition of organic cell phosphate and of its very slow escape from cells at 2° C., an effort has been made to determine the effects of temperature on these processes. The method has been described above, and the results are shown in table II, series 2, which shows that incubation at 37° C. for 1½ hours rapidly increases the hydrolysis of organic phosphate in cells. This is most evident in the early days of storage, when the amount of inorganic phosphate may be doubled. After prolonged storage increase in the total inorganic phosphate present in incubated blood is still evident, but diffusion of the inorganic phosphate from cells to plasma is not balanced by the conversion of organic cell phosphate into inorganic phosphate, for most of the cell phosphate is already hydrolysed; hence cell inorganic phosphate decreases after incubation, whereas after short periods of storage incubation increases the inorganic phosphate of cells.

DISCUSSION

Total acid-soluble phosphate in stored blood.—Normal blood consists of one half plasma containing about 3 mg. of acid-soluble phosphorus per 100 c.cm. and one half cells with a content of 50 mg. per 100 c.cm. The acid-soluble phosphorus content of normal blood is therefore about 26·5 mg. per 100 c.cm. It is probably correct to assume that stored blood contains 30–40 per cent. cells; therefore its content of acid soluble phosphorus should be about 4·5 mg. per 100 c.cm. Estimation of the total acid-soluble phosphorus in the citrate-saline bloods of table I, based on the assumption that all collected bloods contain about one-third cells and the rest diluted plasma, gives figures below 19·5 mg. per 100 c.cm. (except in experiment 1) and suggests very strongly that no absolute increase of acid-soluble phosphorus takes place in stored blood, and that no inorganic phosphorus is formed from lipins even after prolonged storage.

pH of the blood.—The effect of phosphate changes on pH will probably be slight. Diffusion outwards of phosphate will be accompanied either by diffusion outwards of base or by diffusion inwards of chloride and citrate or by both processes, and the total amount of base bound will be unaffected. The hydrolysis of organic cell phosphate will also probably have little effect. According to Rapoport (1937) 65 per cent. of cell phosphate is diphosphoglycerate. Hydrolysis of this into glycerate and phosphate will not increase base binding, for the intact organic phosphate molecule binds 4·6 equivalent of base at cell pH, whereas glycerate alone binds 1 equivalent, and each phosphate ion binds 1·8 equivalents of base, corresponding to 4·6 equivalents of base bound before and after hydrolysis. About 20 per cent. of cell phosphate is easily hydrolysable and probably consists of organic pyrophosphate (Kerr and Daoud 1935). Hydrolysis of this moiety will increase its base binding by 40 per cent. This corresponds to an increase of 8 per cent. in base bound by total phosphate, 2 per cent. in base bound by total cell acids, and about ½ per cent. in base bound in the whole citrate-saline blood. This change in a heavily buffered system like blood would cause practically no change in pH.

Rate of hydrolysis and diffusion of cell phosphate.—The slow hydrolysis of phosphate in stored blood is due to decreased enzyme activity at low temperature. Cold also hinders the diffusion of phosphate through the erythrocyte membrane. At 2° C. diffusion is very slow; at 20° C. the rate has increased by 60 per cent., and at 30° C. the rate is two and a half times as rapid as it is at 20° C. (Maizels 1932). It might be thought that the packing of settled cells in stored blood would also prevent the free escape of phosphate into the citrate plasma; but this is not so, for, if the cells of stored blood are kept suspended by daily mixing, inorganic phosphate still does not diffuse out of the erythrocytes (table II, series 2). Indeed, the cell and plasma phosphate figures are very similar to those found in settled blood, in spite of the fact that daily mixing of blood increases hæmolysis. It is therefore probable that the sole cause of the slow diffusion of phosphate out of cells is the low temperature of storage. An hour's incubation at 37° C. has more effect on the escape of phosphate from cells than have days of cold storage and constant mixing, and the findings confirm the importance of low temperature in maintaining the normal chemistry of cells and plasma.

Conclusion

(1) When fresh blood is mixed with a solution of sodium citrate 1·05 per cent. and sodium chloride

0·85 per cent., there is an initial decrease in volume, because the anticoagulant is hypertonic. Thereafter the cells lose their impermeability to salts, swell, and finally undergo hæmolysis.

(2) These changes may be checked and the blood preserved by the addition of dextrin. Dextrin acts by liberating glucose, which, on the one hand, delays penetration of salts and so checks the swelling of the cells and, on the other hand, increases the surface area of the cell membrane so that it can tolerate a larger absolute inflow of fluid than can the normal cell.

(3) Very little ammonia is liberated in stored blood.

(4) Hydrolysis of organic phosphate within the cell is slow at the storage temperature of 2°–4° C.; significant amounts of inorganic phosphate only appear after a week's storage.

(5) Escape of inorganic phosphate from the cell into the surrounding citrate plasma is slow; an obvious leakage is only apparent after two weeks' storage.

(6) Incubation for 1½ hours at 37° C. of blood stored at 2° C. causes a great increase in intracellular hydrolysis of phosphoric esters and in extracellular leakage of inorganic phosphate.

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SYMPATHOMIMETIC DRUGS

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THE effects produced by epinephrine and by certain other compounds simulate those produced by stimulation of the true sympathetic system. Such drugs have been called "sympathomimetic." Intravenous injection of catechol in a rabbit causes a rise of blood-pressure (Muhlmann 1896), as do chloracetocatechol and acetocatechol (Dakin 1905). Mulinos and Osborne (1935a and b) have shown that catechol, ethylcatechol, acetocatechol, and chloracetocatechol possess sympathomimetic powers in which inhibitory effects predominate. They found chloracetocatechol to be the most powerfully sympathomimetic drug in their series; in it a chloride radical takes the place of the usual amino group ordinarily associated with sympathomimesis. Chloracetocatechol raises the blood-pressure by medullary stimulation and dilates the pupil. Catechol retains its vasopressor power even after pithing and double adrenalectomy but has little effect on the pupil. Blood-sugar of unanæsthetised rabbits is raised; body temperature is elevated. Chloracetocatechol depresses the isolated intestine and virgin uterus in cats, but has no effect on, or occasionally stimulates, the uterus in pregnant cats. The rise of blood-pressure in the intact cat is reversed by ergotoxine, and it is augmented by a previous injection of cocaine. Osborne (1937a) synthesised a series of non-aminated catechol derivatives and found that they caused a rise in the blood-pressure of the intact cat. He concluded that acetylation of catechol and the alpha (3, 4-dihydroxyphenyl) ethanone derivatives did not destroy vasopressor ability. Osborne (1931a, b and c) and Mulinos and Osborne (1935a and b) have concluded from their findings and those of other workers that the catechol nucleus is in great part responsible for the typical sympathomimesis of epinephrine.

REVERSAL OF ACTION BY ERGOTOXINE

Dale (1901, 1906) has shown that ergotoxine blocks the influence of epinephrine on vessels constricted by sympathetic impulses and leaves unaffected the vessels dilated by those impulses; this has been used as a criterion of sympathomimesis. Small doses of epinephrine depress the blood-pressure, and effective doses end by depressing the blood-pressure after raising it. When epinephrine is administered or the sympathetic nerves are stimulated, a catechol-containing substance is liberated within the body. These compounds are sensitive to an enzyme which aids in their rapid destruction. We may conclude that small doses of epinephrine are destroyed too rapidly to have a true sympathomimetic action, and therefore the depression of too small doses and the after-effect of larger doses may be due to degradation products of epinephrine. The presence of the catechol nucleus is common to all the drugs whose actions are reversed by ergotoxine. After ergotoxine the sympathetic myoneural junctions are paralysed to nerve stimulation and to epinephrine. However, it is possible that the reversal of the action of epinephrine is a pharmacologic effect of the degradation products of epinephrine, or indeed of epinephrine itself, on the smooth muscle of the blood-vessels.

Nerve stimulation acts through the liberation of a chemical mediator at or near the effector cell; Bacq (1933) showed the mediator to contain a catechol group and a.ninated side-chain. Ergotoxine reverses this sympathetic stimulating action. The same reasoning may be applied to explain reversal to nerve stimuli as to injected epinephrine—namely, that the chemical mediator (epinephrine or its degradation products) exerts a depressant action on a tissue rendered insensitive to sympathetic stimulation by ergotoxine. Typical sympathomimetics of the non-catechol-containing type (such as ephedrine, synephrine, and neosynephrine) are not reversed by ergotoxine (Nagel 1935, De Eds and Butt, 1927); nor are they sensitive to the enzyme. Hence there are no degradation products to reverse the rise.

Cocaine previously injected magnifies the effects of epinephrine on the blood-pressure. This, too, has been used as a criterion of sympathomimesis. Cocaine sensitisation does not take place with the non-catecholic sympathomimetics (such as ephedrine and tyramine). Cocaine sensitisation is really a test of the susceptibility of the chemical compound to the enzyme responsible for the destruction of epinephrine. We have shown that certain non-catecholic sympathomimetic drugs are not reversed by ergotoxine; these are not sensitive to the enzyme.

SYMPATHIN

Elliott (1907) first correlated the actions of epinephrine and the effects of sympathetic nerve stimulation and suggested that the effects produced by stimulation of nerves might be transmitted to the effector cell by the release of a specific chemical substance. Loewi (1921) verified Elliott's suggestion by direct experimentation. Cannon and his colleagues have demonstrated that, when the lower end of the sympathetic chain is stimulated in an adrenalectomised cat, something passes into the blood-stream which produces at a distance the effects of sympathetic stimulation of other organs. They have shown that stimulation of the splanchnic nerves causes a dis-

charge of a sympathomimetic substance from the liver. This sympathomimetic substance liberated into the blood Cannon has called "sympathin." He investigated the effects of sympathin from the hind legs and tail on the blood-pressure of an anæsthetised intact animal before and after ergotoxine, and he found that after ergotoxine the sympathin liberated produced an immediate slight dip in blood-pressure, which then entered into a definite and prolonged rise. The pupil was not dilated by liver sympathin. Sympathin liberated by the heart when the accelerators were activated did not relax the non-pregnant uterus. To Cannon these results indicated that sympathin and epinephrine were not the same. He concluded that there are two sympathins, one purely inhibitory and the other excitatory; these he calls sympathin I and sympathin E.

In 1936 I suggested that the chemical mediator liberated by the sympathetic nerve-endings through stimulation was epinephrine. The suprarenal medulla is of neurogenic origin, and chemical mediators are products of nerve-endings (Parker 1932); then, if the suprarenal medulla, a modified part of the central nervous system, secreted epinephrine, it seemed logical that the sympathetic nerve-endings (shown to secrete a catecholic substance with aminated side-chain) should likewise secrete epinephrine. Recently Cannon and Lissak (1939) have concluded that epinephrine is liberated at the endings of adrenergic (sympathetic) fibres, and that sympathin, which escapes from the stimulated region into the blood-stream, is this epinephrine modified in the affected cells.

CONCLUSION

It seems most likely that the effects which Cannon has found and attributes to sympathin are the result of the actions of the breakdown products of epinephrine secreted by the nerve-endings which he has been stimulating. There is an enzyme present locally which destroys the epinephrine liberated normally and restricts its effects to that locus. On repeated stimulation in an abnormal manner after Cannon's technique some of these breakdown products of the epinephrine formed by that stimulation escape into the blood-stream and produce the effects of sympathin.

From my experiments I conclude that sympathin E is epinephrine or a close degradation product containing the amine radical, and that sympathin I is a breakdown product, either chlorethanolcatechol, or closely related, without the amine radical; for I have shown that the sympathomimetic amines are principally motor in their effects, whereas the catechol nucleus with a two-carbon side-chain and an indifferent radical on the alpha carbon, not an amine, is principally inhibitory.

Further, as I have recently shown, such experiments as these must be conducted in an adrenalectomised and pithed animal, because these sympathomimetic drugs stimulate the central nervous system directly. It is possible that on stimulation of one locus for sympathin the sympathin elicited escapes into the blood and reaches the medulla, there stimulating the sympathetic centres. Impulses then go down the sympathetic nerves, as I have shown recently, to some other or all the nerve-endings of the sympathetic system, liberating more sympathin or, as I prefer to call it, epinephrine and its degradation products, which will complicate the experimental picture produced.

The reversal mechanism from ergotoxine may be explained as a pharmacologic phenomenon of the relatively stable degradation products of epinephrine.

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NERVOUS COMPLICATIONS OF WEIL'S DISEASE

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THE following is a brief account of a case of Weil's disease with meningitis, flaccid paralysis of the lower extremities, and atypical serological features, attributed to *Leptospira sejrø*. The detailed case-history, together with the laboratory finding, has already been published (Mortensen 1939).

A farmer, aged 59, with a past history of good health, entered the hospital with a serious attack of an acute febrile disease. He had conjunctivitis, pronounced muscular tenderness, cerebral disturbances (bradyphrenia, headache and dizziness), jaundice and albumin and casts in the urine, with nitrogen retention, besides meningitis (rigidity of the neck and back, positive Kernig sign, and increase in lymphocytes and albumin in the cerebrospinal fluid).

After a transitory improvement of his condition the patient became worse about three weeks after the onset, with aggravation of the cerebral meningeal symptoms, and there appeared at the same time a complete flaccid paralysis of the lower extremities with absence of the knee-jerk. On the next day the patient could already slightly flex the knee-joints. In the following month the muscular power improved gradually but slowly, the patient could move about with support, and the knee-jerk could be elicited. Two weeks later the patient was discharged, feeling perfectly well and walking almost normally.

SEROLOGICAL REACTIONS

The combination of damage to the kidneys and liver with conjunctivitis and pronounced muscular tenderness suggested Weil's disease. A specimen of blood taken on the tenth day of illness, shortly after admission to the hospital, gave a positive serum reaction—as did also subsequent blood specimens repeatedly—with *L. icterohæmorrhagiæ* and with *L. canicola*; and on the twenty-first day of illness leptospiræ were demonstrated in the urine.

In the State Serum Institute of Copenhagen, however, the serological reactions were designated as atypical, and later, long after the patient had been discharged, it was established that this case was one of infection with the *L. sejrø* described by Petersen and Christensen (1939). Dr. Borg Petersen, of the State Serum Institute, has been kind enough to give me the following account of the serological features.

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For the following reasons we thought from the very start that the serological reactions in this case were atypical:

(1) The titres were lower than those usually observed in patients suffering from Weil's disease or from canicolar fever.

(2) Different strains of the same serological type gave widely different reactions with the patient's serum. Usually the deviations are small in tests made with homologous strains.

(3) For those strains that gave the highest titres the course of the reaction was atypical: after typical reactions in the weaker dilutions very faint reactions persisted through a fairly long series of the higher dilutions. Usually there is a very sudden change from positive to negative reactions.

(4) On an average the serum of the patient reacted about equally strongly with strains of the icterohæmorrhagic type and strains of the canicolar type. Usually the reaction is considerably stronger with one type than with the other.

(5) All the icterohæmorrhagic and all the canicolar antibodies could be removed from the serum of the patient by absorption with a single strain, no matter whether this was an icterohæmorrhagic strain or a canicolar strain.

A possible explanation of these findings would be that this case was one of infection with a leptospira of a hitherto unknown serological type (*L. grippotyphosa* gave a negative reaction), and that the positive reactions were merely co-reactions. Such co-reactions are known to behave most irregularly.

This explanation was confirmed in December, 1937, when it was found that *L. sejrφ*, which had been isolated shortly before, gave strong positive reactions with the specimens of serum obtained from this patient in the spring of 1937 and kept in an ice-box. At the same time, it was found that the titres of these sera for the strain with which they had given the strongest reaction in the spring were now much lower (see the accompanying table). From these findings it seems most likely that the disease was produced by *L. sejrφ*.

TITRES OF SPECIMENS OF PATIENT'S SERUM FOR TWO STRAINS OF LEPTOSPIRA

Day of illness	*Leptospira canicola* strain "Alarich"		*Leptospira sejrφ* strain "M. 84"
	On the day after the blood was taken	After storing of serum for 5–8 months at 4° C.	
10th	300	30	100
17th	3000	30	10,000
28th	1000	30	3000
39th	30	30	300
124th	100	—	300

COMMENTS

Clinically this case differs from typical cases of Weil's disease in the appearance of meningitis with changes in the spinal fluid and in the occurrence of transitory flaccid paralysis of the lower extremities. Meningitis is no rare complication in Weil's disease. Costa and Troisier (1916) described a special form of Weil's disease which they designated as *spirochétose méningée* because the clinical picture was dominated by a meningitis due to *L. icterohæmorrhagiæ*. Later they gave a more precise description of this meningitis, which in their opinion is a common complication in Weil's disease (Costa and Troisier 1917). Different forms of the lesion are set up according to whether the clinical picture of a given case is dominated by the classical Weil symptoms or by the meningitis. In *la forme complète* the meningitis is a complication of the classical disease; in *la forme méningée avec ictère* the meningitis is the predominant feature, while the jaundice is less conspicuous. Finally, the disease may appear with exclusively meningeal symptoms, while the jaundice is entirely absent—*la forme méningée pure*.

The first paper by Costa and Troisier (1916) on meningitis in Weil's disease was soon followed by numerous reports on this combination. Troisier and Boquin (1933) have dealt with the question on a broader basis, giving a number of case-histories of pure meningitic forms besides forms accompanied by jaundice. Cochez and Fichet (1933) reported 3 new cases of *spirochétose méningée anictérique* and emphasised the following triad of symptoms as particularly characteristic of this disease: a mild meningeal syndrome, labial or palpebral herpes, and conjunctival injection.

Among 312 Dutch patients with Weil's disease Schüffner and Walch-Sorgdrager (1936) found 25 cases with true meningitis, and in 1 case they cultivated spirochætes from the spinal fluid. They said that meningitis was commoner without jaundice than with jaundice. As a general rule the meningitis appears in the acute stage of the disease; but Murgatroyd (1937) reported a case which deviated in several respects from the usual course; for one thing, the first signs of meningitis were observed four months after the onset of the disease, and spirochætes could be cultivated from the spinal fluid as late as six months after the onset. Meningitis thus appears to be such a common complication in Weil's disease that the possibility of meningitis must be considered in every case, just as Weil's disease must be considered in every obscure case of meningitis.

Although our case is by no means extraordinary with regard to the meningitis, it is of particular interest in respect of the flaccid paralysis of the lower extremities. Whereas an affection of the meninges is fairly common, an affection of the nervous parenchyma is rare, apart from a slight spread from the meninges manifesting itself by transitory weakening or abolition of the tendon-reflexes, which become normal again when the meningitis subsides. I have found only 4 cases described in which flaccid paralysis of the lower extremities (of central origin) developed in the course of a Weil infection; 2 of these cases resembled our case, whereas the lesion in the other 2 cases was accompanied by paralysis of the bladder and interpreted as transverse myelitis.

The first case was reported by Creyx, Georget, and Bonnel (1935). A man, aged 28, in the acute stage of an infection with *L. icterohæmorrhagiæ*, had symptoms of acute meningitis, with increase in the cell count and albumin content of the spinal fluid. The serum reaction for icterohæmorrhagic spirochætes was +1:10,000. In the first week of illness there appeared a complete paralysis of both lower extremities, with abolished tendon-reflexes; the sphincters were not disturbed. Two weeks later the patient could move his legs; three weeks later the tendon-reflexes were normal; and after eight weeks the patient was discharged without any complaint.

Another case was reported by Labbé, Boulin, Uhry, and Ullmann (1935). The patient was a man, aged 47, who suddenly had symptoms of acute meningitis. After five days the symptoms subsided, but now there appeared a flaccid paralysis of the lower extremities, without disturbances of sensation or of sphincters. Next day the patient presented all the classical signs of Weil's disease: conjunctivitis, herpes, jaundice, albuminuria, cylindruria, hæmaturia, and azotæmia. The serum reaction for icterohæmorrhagic spirochætes was + 1 : 1000. The patient died in the acute stage of anuria.

Hegler (1936) and Fontan, Dupin, and Verger (1938) have each described a case of Weil's disease with flaccid paralysis of the lower extremities and paralysis of the bladder. They have explained these symptoms as resulting from transverse myelitis produced by the spirochætes.

Besides these few cases with involvement of the central nervous system, several cases have been described in which peripheral nerves have been attacked by icterohæmorrhagic spirochætes. Thus, Joosten (1936) has described a case of Weil's disease with flaccid paralysis of the lower extremities, pain, and tenderness on pressure along the nerve trunks; and these symptoms were interpreted as resulting from a polyneuritis. Klieneberger has described polyneuritis with ataxia and disturbances of sensation. Japanese authors have reported facial paralysis, pareses of the muscles of the eye, recurrens paralysis, and sciatic neuritis as complications in Weil's disease.

Morbid anatomical changes in the central nervous system in Weil's disease have been described, among others, by Bingel (1936), who in one case found changes in the meninges and in the parenchyma of the brain. The latter changes were localised especially round the blood-vessels, suggesting that the process originated therefrom and was not due to a spread from the meninges. Bingel explains these changes as resulting from ischæmia due to terminal impairment of the circulation.

Recapitulating the complications that may affect the nervous system in Weil's disease, we have the following conditions:—

(1) Cerebral symptoms, such as headache, restlessness, dizziness, and bradyphrenia, due to the general infection and encountered very often in patients with Weil's disease.

(2) True meningitis with changes in the spinal fluid and sometimes with spirochætes in the spinal fluid—a fairly common complication in Weil's disease. Statements differ widely as to the frequency of this condition; Schüffner and Walch-Sorgdrager (1936) estimate the incidence to be about 10 per cent. Meningitis may be the only manifestation of a Weil infection.

(3) Symptoms indicating an affection of the nerve parenchyma, which in milder cases (reduced or abolished tendon-reflexes, possibly slight pareses) may conceivably result directly from the meningitis as a spread to the nervous parenchyma.

(4) In rare cases complications indicating a more severe affection of the cerebral parenchyma that is not due to a spread from meningitis but is a complication per se. That the spirochætes may tend to attack the nerve parenchyma seems probable in view of the fact that complications involving the peripheral nerves are encountered not uncommonly.

Whether there is any connexion between the atypical picture of the disease in our case and the fact that it was due to an infection with *L. sejrø* cannot be decided conclusively, but it seems hardly probable. In the previously reported instances of paralysis in Weil's disease the affection was due to *L. icterohæmorrhagiæ*, and of the cases reported so far in which *L. sejrø* has been diagnosed the clinical picture has differed from the usual only in the case here described.

SUMMARY

A description is given of a case of Weil's disease complicated with meningitis and complete paralysis of the lower extremities. The course was benign. Serologically the case was atypical too, being caused by *L. sejrø*, described previously by Petersen and Christensen (1939). There is not likely to be any relation between the atypical clinical course of this case and the atypical serological findings. A brief survey is given of complications of the nervous system in Weil's disease.

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HERNIATION OF THE STOMACH WITH ANÆMIA

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Many observers, particularly in America, have commented on the increasing frequency with which the diagnosis of herniation of the stomach through the diaphragm is made. In many of the cases so diagnosed there is a history of trauma, and there can be no doubt that the increased tempo of living and of dying, alike due to the vast growth of motor traffic, is responsible for many of them. It is, however, difficult to believe that there can have been any increase in the number of cases due to congenital abnormalities, and it is reasonable to suppose that the growing number of these now discovered is due to improved methods of diagnosis and in particular to the more extensive employment of radiography. Most of the cases of herniation of the stomach through the diaphragm recorded in the past few years have been discovered by radiography undertaken for obscure abdominal or thoracic symptoms; in many these were not urgent. Some cases have been discovered at autopsy (Bailey 1919) in extreme old age after a life devoid of referable symptoms of any sort.

SITES OF DIAPHRAGMATIC HERNIA

The sites of herniation of the abdominal viscera through the diaphragm are (1) the pleuroperitoneal hiatus; (2) the dome; (3) the para-œsophageal hiatus; and (4) the foramen of Morgagni (Donovan 1938, Shanks, Kerley, and Twining 1938). The para-œsophageal herniæ, to which class belong both of these here reported, appear to be the commonest. Bailey (1919) was the first to point out that in many cases of protrusion of a part or the whole of the stomach through the para-œsophageal hiatus the condition is not a true herniation but a congenital abnormality; in these cases the stomach never at any course of development occupied its proper position wholly below the diaphragm. Goodall and Hoyt (1934) and Shanks et al. (1938) distinguish between true para-œsophageal herniation of the stomach and complete or partial congenital "thoracic stomach." Both cases reported here appear to be of true herniation.

It is probable that, as pointed out by Weitzer (1932), herniation of the stomach through the dia-

phragm, particularly at the para-œsophageal hiatus, would be found much more frequently than it is, were it not that it is almost impossible to identify it by radiography after a barium meal taken in the upright position. Bowen (1938) states that herniæ at the œsophageal opening respond particularly well to surgical treatment; in view of recent advance in surgical technique and enthusiasm the discovery of this condition may be regarded as now constituting one of the major risks of radiography.

Although obstruction either of the stomach or of any other viscus may develop in herniation through other sites, no case appears to exist of obstruction produced by protrusion of the stomach through the œsophageal hiatus. When symptoms do appear in association with herniation of the stomach at this site they usually take the form of thoracic or abdominal discomfort and bouts of dyspnœa or of vomiting. Several observers have recorded cases in which anæmia has been the major symptom. In both cases described below the patient was in the first instance seen for this cause.

CASE-RECORDS

CASE 1.—A boy, aged 15, first seen at the request of Dr. P. Carroll, of Wolverhampton, in September, 1934, for anæmia. At 7 and 11 he had had abdominal operations for appendicitis and "intestinal obstruction." Not well since. Lassitude for some time past; three days before being seen, he fainted on getting out of bed. Appetite good; "eats well and plenty." Patient well nourished but pale. A blood-count gave the following figures:—

Red cells	4,010,000	Polymorphs	58%
White cells	6100	Lymphocytes	36%
Hæmoglobin	39%	Monocytes	3%
Colour-index	0·48	Eosinophils	1%
		Basophils	2%

Films showed hypochromia of red cells but no other abnormalities. On physical examination nothing significant was discovered; the anæmia was regarded as of iron-deficiency type, and treatment with iron in full doses was recommended to be carried out by the patient's doctor.

Patient was again seen at age of 18 in January, 1938. Well until about three months before, when he began to experience attacks of "light-headedness." Latterly there had been some pain after food and increasing pallor. Blood now showed hæmoglobin 48 per cent., with 3,680,000 red cells per c.mm., giving a colour-index of 0·66. White cells 8000 per c.mm. Mean diameter of red cells 7·2 μ. In view of the possibility of the anæmia being due to bleeding from a duodenal ulcer, radiograms were requested and taken by Dr. Dyas.

While waiting among other outpatients to be seen the patient had a typical epileptiform fit. In reporting to the patient's doctor it was remarked: "This boy solved the problem of the nature of his attacks of light-headedness by having an epileptic fit in the department here this morning." This was before the radiograms had been seen; they showed extensive herniation of the cardia of the stomach through the œsophageal orifice. The appearances are described and commented on by Dr. Dyas below.

Treatment was given as before with ferri et ammon. cit. gr. 30 thrice daily. By Feb. 14 the hæmoglobin was 54 per cent. and by March 14 91 per cent. Patient seemed very well and thereafter ceased attending. By request he attended again on March 27, 1939. His health in the meantime had been excellent. Radiograms showed persistence of the hernia of the stomach. Examination of the blood showed hæmoglobin 73 per cent.; red cells 5,360,000 per c.mm.; white cells 9600 per c.mm.; colour-index 0·68; mean diameter of red cells 7·6 μ (halo); corpuscular volume 40; mean corpuscular volume 74 c.μ; mean corpuscular hæmoglobin 18·7 $\gamma\gamma$; mean corpuscular hæmoglobin concentration 25 per cent.; volume index 0·87; and saturation index 0·71.

CASE 2.—Male, aged 51, seen with Dr. R. W. Thompson, of Walsall, on Jan. 5, 1939, complaining of "turns" of faintness for the past year and of discomfort in the arms and legs for the past six months. The faint turns occurred irrespective of exercise. He had been seen by a cardiologist, and an electrocardiogram was normal. For some time past there had been dyspnœa on exertion, and for the past ten days burning pain in the arms and legs, worse at night, had been a distressing feature. Comment on the presence of a bottle of "stomach powder" on the mantelpiece elicited the information that for some months past there had been occasional bouts of gastric discomfort. Patient pale but well nourished; knee-jerks active; no alteration of sensation detected; apart from this nothing greatly amiss could be found.

Examination of the blood showed hæmoglobin 40 per cent., with red cells 4,540,000 per c.mm., giving a colour-index of 0·44. Mean diameter of red cells 8·0 μ (halo). The red cells showed a high degree of polychromasia with anisocytosis and many obvious macrocytes. A specimen of fæces taken in view of the gastric history showed a fair amount of occult blood. The blood picture was obviously neither that of pernicious anæmia nor that of anæmia due to ordinary bleeding from a peptic ulcer. Treatment with ferri et ammon. cit. and Marmite was recommended, and it was suggested that radiograms of the stomach should be taken as soon as circumstances would allow.

On Feb. 14 patient was again seen. Blood now showed hæmoglobin 120 per cent.; red cells 6,600,000 per c.mm.; colour-index 0·91. Films now showed no abnormalities of the red or white cells. Mean diameter of red cells 7·5 μ. Fæces now showed no occult blood. The patient appeared extremely well but still complained of slight dyspnœa. This, until the radiograms became available, was attributed to neurosis. At the time of writing (April, 1939) patient is well except for occasional slight dyspnœa.

Radiograms (Dr. G. E. Dyas).—The fluoroscopic and radiographic appearances in these two cases

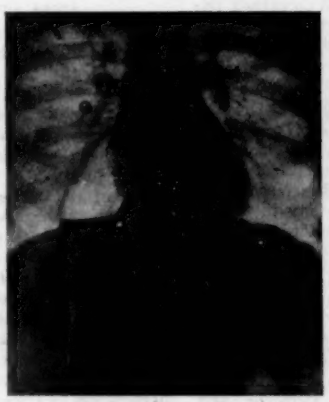

FIG. 1—Postero-anterior radiogram of case 1 standing.

FIG. 2—Oblique radiogram of case 1 lying down.

were similar. At the fluoroscopic examination the passage of barium down the œsophagus showed deviation and looping of the cardiac end of the œsophagus. The barium then passed into the cardiac end of the stomach above the diaphragm, and rotation of the patient showed this portion of the stomach to be encroaching on the posterior mediastinal space. In both cases the œsophagus was of normal length.

Case 1 was given a barium meal and examined standing (fig. 1). After this he was placed lying down in the oblique position. He was then given a mouthful of barium, and a radiogram was taken when the bolus had reached the lower end of the œsophagus (fig. 2). Radiograms of case 2 were taken with the patient standing (figs. 3 and 4).

These two cases present examples of para-œsophageal herniation of the stomach. In both of them it was possible to see the cardiac portion of the stomach above the diaphragm, with the patients in the upright position.

FIG. 3—Postero-anterior radiogram of case 2 standing.

FIG. 4—Oblique radiogram of case 2 standing.

DISCUSSION

From the clinical standpoint these two cases are interesting in view of the association of what can hardly be better described than as "turns" and of anæmia with diaphragmatic herniation of the stomach. In case 1 the "turns" were described as attacks of "light-headedness"; in case 2 as "faint turns." In case 1 one at least of these "turns" took the form of an epileptiform fit, which at the time left no doubt in the minds of any of the observers about its true epileptic nature. As to the exact causation of these "turns" it appears idle to speculate.

The anæmia in both cases was of hypochromic type; in case 2 it showed the unusual combination of hypochromia with macrocytosis. Unfortunately, specimens taken did not allow of estimation of the mean corpuscular volume. The films, however, showed very evident macrocytosis, and there can be little doubt but that it would have proved to be above normal.

The most striking feature of the anæmia in both cases was the extraordinary readiness with which it responded to iron in full dosage. In case 1 the hæmoglobin rose from 48 to 91 per cent. in eight weeks and in case 2 from 40 to 120 per cent. in six. It is further remarkable that in both cases the improvement of the blood condition was accompanied by improvement in the general health and the practical disappearance of all symptoms.

There has been some discussion about the causation of the anæmia in herniation of the stomach. Gardner (1933) considers it due either to "obscure changes" in, or to bleeding from, the congested gastric mucosa. Goodall and Hoyt (1934) believe that when anæmia develops in these cases it is due to a gastric ulcer. It is difficult to believe that a six-weeks' course of iron can cure a gastric ulcer, and so far as the two cases described above are concerned the assumption of Goodall and Hoyt may be discarded. As pointed out above, the readiness with which the anæmia in both cases responded to iron was striking. In case 2 the fæces at the first examination showed occult blood in fair amount, and it is probable that there was a good deal of congestion with some oozing from the gastric mucosa. On the face of it, however, it seems unlikely that this could have been sufficient to produce the degree of anæmia found. Further, the macrocytosis and other morphological alterations found in the red cells are not those associated with anæmia due to prolonged loss of blood.

The evidence indicates that in both cases there was a severe failure in assimilation of iron; such failure is common in many disorders of the gastro-intestinal tract, but its causation is obscure. Mettier and Minot (1931) have shown that such failure is often associated with hypochlorhydria or with achlorhydria; the state of the gastric secretion was, unfortunately, not investigated in either of these cases.

The macrocytosis found in case 2 is peculiar. This feature is usually associated with a failure in red-cell maturation, such as is brought about by absence or deficiency of the anti-anæmia principle of the liver. The work of Castle has made it clear that the intrinsic factor of this is elaborated in the stomach, and Meulengracht (1935) has shown that, while the main site of its production is the pyloric end, it is also produced at the cardiac end. It is possible that partial failure in the production of the intrinsic factor played some part in the macrocytosis in case 2. Iron in full dosage with marmite, however, restored the blood picture to normal.

Pains in the hands and feet were a distressing feature in case 2. These naturally raised the question of subacute combined degeneration of the cord; it is interesting to recall that Murphy (1939) found herniation of the stomach in no fewer than five of his cases of pernicious anæmia. In case 2, however, the pains were rather more acute than is usual in subacute combined degeneration; moreover, they were unaccompanied by pins-and-needles or by any form of disturbance of sensory acuity. The pains were of a "burning" nature and somewhat reminiscent of those often reported as developing in certain outbreaks of the pellagrous syndrome, to which numerous references are given by Stannus (1936). Bender (1925) drew attention to pellagrous symptoms in patients with faulty food utilisation due to gastro-intestinal lesions, and Simpson (1935) has collected several such cases. It is not suggested that this patient was suffering from pellagra but that the gastric lesion and resultant deficient utilisation of food caused both a macrocytic anæmia not of "pernicious" type and nervous manifestations not due to subacute combined degeneration of the cord.

In both cases the prompt response of the anæmia and the disappearance of symptoms on the exhibition

of iron in full dosage suggest deficient absorption of iron as a main factor in the causation of the ill health. The "obscure changes" in the gastric mucosa postulated by Gardner (1933) and not gross hæmorrhage must be regarded as the main cause of the anæmia in these two cases.

SUMMARY

Two cases of herniation of the stomach through the para-œsophageal hiatus are described.

In both cases anæmia and "turns" were the presenting symptoms.

Rapid disappearance of the anæmia and restoration of health followed treatment with iron in full dosage.

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A SIMPLE APPARATUS FOR CONSTANT SUCTION

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THE device invented three centuries ago by the famous French physicist Edmé Mariotte (1620–1684) and often known as "Mariotte's bottle" has been adapted for use in the treatment of spontaneous pneumothorax. It can, however, be adapted to suit almost any cavity in which it is desired to maintain a constant low negative pressure.

METHOD

The apparatus consists of a large bottle, A, capable of holding at least 80 oz. of fluid and having at the bottom an outlet, B, provided with a tap (see figure). This outlet tube must be straight and not curved downwards; otherwise it may act as a siphon. The neck of the bottle is closed with a rubber cork, pierced by a tube, E, which dips below the level of the water in A and can slide in the cork, so that its height may readily be altered. When tap B is opened, water will flow from bottle A, and air will be drawn in through tube E. If E is closed, or if it communicates with a closed cavity, a negative pressure will develop within it, proportional to the height of its lower end, X, above the level of the outflow, Y. Thus, if the distance X—Y is 10 cm., a negative pressure of 10 cm. of water will develop in E when tap B is opened.

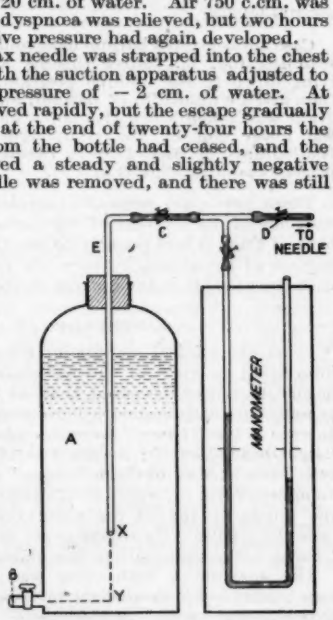
When this apparatus is used in the treatment of spontaneous pneumothorax, the suction tube E is connected by rubber tubing with a pneumothorax needle strapped in position. It is also convenient to incorporate a water manometer in the system to measure both the intrapleural pressures when clip C is closed and the negative pressure developed by the apparatus when clip D is closed. Bottle A should be refilled, with clip C closed, before the water falls below the level of X.

ILLUSTRATIVE CASE-RECORDS

The following cases will illustrate the use of this apparatus:—

CASE 1.—Female, aged 42, with bilateral chronic pulmonary tuberculosis. A bilateral artificial pneumothorax had been induced, and two months later the patient suddenly developed a spontaneous pneumothorax on the left side. She was intensely dyspnœic, and the intrapleural pressures on the left side were + 8 + 20 cm. of water. Air 750 c.cm. was removed, and the dyspnœa was relieved, but two hours later a high positive pressure had again developed.

A pneumothorax needle was strapped into the chest and connected with the suction apparatus adjusted to give a negative pressure of − 2 cm. of water. At first air was removed rapidly, but the escape gradually became less, and at the end of twenty-four hours the flow of water from the bottle had ceased, and the manometer showed a steady and slightly negative swing. The needle was removed, and there was still sufficient pleural space to enable the pneumothorax to be continued.



CASE 2.—Female, aged 34, with chronic bilateral pulmonary tuberculosis. The left lung had been collapsed by a ten-rib thoracoplasty, and a right artificial pneumothorax had been induced. A month after the induction the patient became acutely dyspnœic, and the pressures in the pneumothorax were − 2 + 10 cm. of water.

Air was removed, and this process had to be repeated every few hours for the next two days to relieve the dyspnœa. Finally a needle was strapped into the chest and connected with the suction apparatus. The patient immediately became comfortable, and twelve hours later air had ceased to escape. The needle was removed, and, since the lung had not completely re-expanded, it was possible to continue the pneumothorax as before.

COMMENTS

The foregoing cases have been chosen as examples because it is unlikely that the pneumothoraces could have been maintained by any of the usual methods of treatment. The advantages of this apparatus are that it prevents the development of a positive intrapleural pressure, thus giving continuous relief to the patient, and that it does not exert a high negative pressure. The ordinary under-water drain is effective until the bronchial fistula seals off. After this, when the patient coughs, air is forced out and the column of water in the tube rises, thus exerting an increasing negative pressure which tends to reopen the fistula. Other methods of suction, such as a filter pump, are even more powerful. If the fistula closes, the negative pressure tends to bring the lung rapidly out to the chest wall, and a good therapeutic pneumothorax may thus be lost. The apparatus which is described here can be adjusted to produce a negative pressure so small that it exerts practically no pull on the lung and yet is sufficient to remove any excess of air and to relieve the patient's distress.

THE CENTRAL NERVOUS SYSTEM IN CONGENITAL ABSENCE OF ONE LEG

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Records of investigation of the central nervous system in man or animals in cases of congenital abnormalities of the limbs, whether it be absence of parts or the reverse—e.g., polydactyly—are singularly scarce. This line of approach to the study of the nervous system presents certain possibilities of which advantage could be taken to a much greater extent than has been done heretofore.

Taft (1920) compared the anterior-horn cells in the normal spinal cord and after amputation and stated, as a summary of his findings, that cell counts of the two sides of the cord showed no significant difference in cases of amputation. But Campbell in 1896 said:

"In long-standing cases the predominant change is a homolateral atrophy, represented by a general reduction in volume of white and grey matter alike, and involving those particular segments of the cord which receive and give off the sensory and motor nerves which originally supplied the skin and muscles of the amputated member . . . while all the cell collections in the anterior cornu suffer, one special group may be singled out as being specially prone to atrophy, namely the postero-lateral."

In view of this conflict of evidence the present case, which supports Campbell's findings, is of interest.

CASE-RECORD

The patient, from whom the brain and spinal cord here described were obtained, was a woman, aged 75, who died from pneumonia. Congenital abnormalities included complete absence of the left leg below the knee, except for a piece of bone roughly the size and shape of the upper epiphysis of the tibia (fig. 1*a*); and complete absence of both hands, except for rudimentary thumbs and, on the right side, a small stunted finger (fig. 1*b*). The family history was negative along all lines. Despite her disabilities the patient had successfully reared a large family.

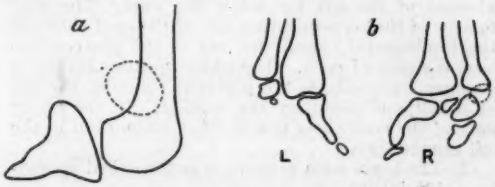

Fig. 1—Outline diagrams of radiograms: (*a*) left knee-joint, showing bony fragment, roughly the shape and size of the upper epiphysis of the tibia; dotted outline represents the patella; (*b*) both wrists, showing on each side a rudimentary thumb, represented by a fused carpal-metacarpal bone, articulating with which is a small phalanx; and, on the right side (R) also a small stump of a finger present on the ulnar side.

MORBID ANATOMY

Treatment of tissues.—The post-mortem examination was made thirty-six hours after death, when the brain and spinal cord were removed and fixed in formol saline. Blocks were prepared from various levels of the spinal cord, the brain stem, and the limb centres of the cerebral cortex. Sections were cut at 15 μ and stained by (1) the modification of Bodian's silver technique used in this department and (2) toluidine blue.

Spinal cord.—A series of sections made from the cord at various levels, shows that, although at no place is the cord symmetrical, the greatest asymmetry is obviously in the sacral region (fig. 2). At that level the left side of the cord is very much smaller than the right, the disparity being noticeable in all elements: grey matter, white matter, and both sets of nerve-roots.

As regards the grey matter of the cord, in the sacral region the left side, anterior and posterior horns, is very definitely the smaller, and from the left anterior horn the post-posterolateral group of cells is absent. Other observers have recorded the absence or diminution of the posterolateral group of cells in such cases; only one (Tsang 1939) mentioned the post-posterolateral group, and that was when identifying it in connexion with polydactyly. The explanation of the difference in cell group affected is probably as follows. In the case here described the primary loss is of the foot—a knee-joint of a sort does exist—and therefore the cell group which corresponds with the muscles of the foot—i.e., the postposterolateral—is likely to be the group affected. In cases of high surgical amputation the structural loss is greater and the functional loss much greater; and in these cases the absence of the posterolateral group may cause the smaller defect—i.e., absence of postposterolateral group—to be overlooked.

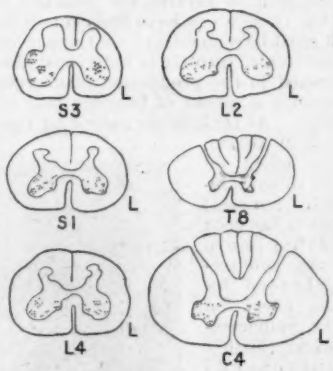

Fig. 2—Outline drawings of the spinal cord at six levels, from third sacral to fourth cervical nerve-root attachment. L indicates the left side.

As the grey matter is traced upwards it becomes rapidly more nearly equal on the two sides in the lumbar region but is not exactly equal till the lower thoracic region is reached. In the cervical enlargement there is no significant difference in cell groups or numbers of cells between the two sides; this is as might have been expected, for the congenital deformities of the upper limbs were bilateral and almost identical.

Throughout the length of the cord the amount of white matter on the right side exceeds that on the left; this is true for each of the three columns but most of all for the posterior. As regards the posterior columns, in the midsacral region it can be seen clearly that certain fibres are absent from the left posterior column; and, as this column is traced upwards, the identity of the tract which is depleted can be established—namely, the gracile. The discrepancy between the two posterior columns increases from sacral region to upper lumbar region but thereafter stays constant. The big effect made by the absence of the foot and leg on the size of the gracile tract seems to be reasonable in view of the rich sources of epicritic and proprioceptive stimuli which have been lost.

The anterior and lateral columns are more nearly equal on the two sides, but accurate measurement of their sectional area demonstrates that those of the left

side are slightly smaller. An interesting point arises here. If the fibres of the pyramidal tract to the left leg had been atrophied, the area of the right lateral column should have been less than that of the left. This was not so; therefore it can be assumed that the pyramidal fibres were largely intact. That they managed to survive the patient's lifetime indicates that these fibres have been functionally active; but it must be remembered that upper motor neurones are not related directly to individual muscles but are concerned in the production of movements which may involve a spread of function into other parts of the limb. As regards the ascending tracts in the antero-lateral region, the effect on the spinothalamic (crossed) tracts has been rather more than counterbalanced by the effect on the spinocerebellar (mainly uncrossed) tracts.

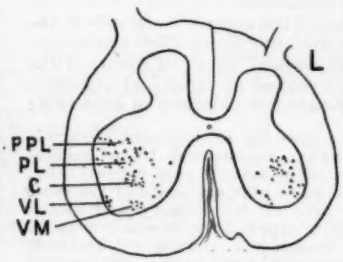

FIG. 3—Photomicrograph of the spinal cord at the level of the third sacral nerve, stained with silver. Alongside is a diagram of the section, with the various nerve-cell groups indicated: C, central; PL, posterolateral; PPL, postposterolateral; VL, ventrolateral; VM, ventromedial. L indicates left side.

Brain stem.—In sections through the medulla and pons features such as the gracile and cuneate nuclei, the olives, and accessory olives were carefully examined in serial sections, but at no level in the brain stem could any asymmetry be demonstrated.

Cerebral cortex.—With a view to comparing the structure of the cerebral cortex on the two sides of the brain, blocks of tissue were cut from the precentral gyri, from as closely corresponding situations as possible. Sections were cut at 15 μ and stained by toluidine blue, and the Betz cells in each section were counted. Counts totalling several hundreds were completed without any tangible difference between the results of the two sides; the sections from the leg centres gave as closely equal results as those from any other parts of the motor cortex. If this can be accepted as a true indication of the relative numbers of upper motor neurones present on the two sides of the cerebral cortex—the objection being the technical difficulty of getting accurate comparable figures of cell counts in this region—the Betz cells of the left leg centre have remained physiologically active for 75 years, despite the absence of the left leg below the knee. Here again, as with the pyramidal tracts in the cord, the explanation is probably related to the functional association of the upper motor neurones with group muscle actions.

NATURE OF CONGENITAL ABNORMALITIES OF LIMBS

Abbe (1916) said: "We believe that the non-development (of fingers) is due to deficiency in the control of the developing tissues by the central nervous system." If this statement is true, the term "amputation" should not be applied to the condition. Latta (1925) supported the view most commonly held and most widely quoted—namely, that congenital deformities, such as absence of digits, were due to amniotic adhesion bands, and he gave as the primary cause anomalous development of the amnion. Streeter (1930) said that there was no evidence of intra-uterine amputation being due to amniotic bands, but that the probable explanation was one of variation in tissue quality in the developing embryo. He also considered that, when amniotic bands were found together with "congenital amputations," both conditions were due to the same fundamental fault. Tsang (1939), working on polydactyly in mice, gave as his conclusion that polydactyly was due to hypertrophy of the postposterolateral column of cells in the anterior horn.

There are, then, at least three theories of the causation of congenital abnormalities of the limbs:

(1) Faulty development of the nervous system through either failure of certain cells to develop or the reverse—i.e., hypertrophy of a group of cells.

(2) Amputation of normally developed limbs in whole or part by amniotic bands.

(3) Faulty quality of the original primordium of the extremity.

The ultimate proof or disproof of any or all of these theories is doubtful, if not impossible, and the case here described, although showing changes in the nervous system coincident with abnormalities of the limbs, justifies no definite statement as to which condition was primary. The value of such investigations, including cases of surgical amputation, lies rather in the evidence they afford of the topographical relationships in the central nervous system.

SUMMARY

(1) The spinal cord, brain stem, and cerebral cortex have been examined in a case of congenital absence of the left leg below the knee. The grey matter of the corresponding side of the cord shows in the lumbosacral region the loss of the postposterolateral group of cells. The white matter also shows changes, especially in the posterior columns, the left of which was definitely the smaller. In the upper part of the cord there is a distinct diminution in the left gracile tract.

(2) The brain stem presents a symmetrical appearance throughout.

(3) Betz-cell counts of both precentral gyri gave almost identical totals.

I wish to express my thanks to Prof. D. M. Blair for his advice and criticism; to Prof. N. Morris, who suggested the investigation of this case from his wards; and to Dr. F. E. Reynolds, pathologist to Stobhill Hospital, for his valuable coöperation.

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Dr. J. Sim Wallace has been elected an honorary fellow of the Society of Medical Officers of Health in recognition of his pioneer work on the prevention of dental caries.

CLINICAL NOTES

COMPARATIVE MOBILITY OF MUSCLES AS A GUIDE IN SURGICAL EXPOSURES

By Arnold K. Henry, M.B. Dubl., M.Ch. (Hon.) Cairo, F.R.C.S.I.

EMERITUS PROFESSOR OF CLINICAL SURGERY IN THE UNIVERSITY OF EGYPT; READER IN SURGERY IN THE UNIVERSITY OF LONDON, AT THE BRITISH POSTGRADUATE MEDICAL SCHOOL

Even with increasing surgical experience gross aspects, such as ulnar or radial sides, are sometimes hard to recognise in draped limbs during operation. That is my excuse for describing a way of making other broad distinctions.

Certain muscles have relatively long free bellies attached only at each end; others are more widely bound. When the first kind adjoins the second, useful information can be got by grasping the free belly and moving it over its fixed companion. This test of relative mobility has helped me in the following five surgical exposures:—

(1) In cutting down on the distal half of the humerus I have made (and seen made) the mistake of dividing the belly of the biceps muscle instead of the lateral part of the brachialis muscle, which separates skin from bone. No mere line will guide the surgeon in every limb; fat, posture, and muscular development contribute to his disorientation. If, however, he grasps the front of the lax anæsthetised arm, he can move the biceps across the wide humeral attachment of the brachialis muscle, whose fibres he then splits lengthwise to expose the shaft, safeguarding the radial trunk by cutting towards the middle line of the bone (Henry 1924).

(2) When the deep branch of the radial nerve trunk is exposed from behind (the old posterior interosseous nerve), the knife should enter between the extensor carpi radialis brevis and extensor communis muscles (Stookey and Guild 1919). With the forearm prone, the line for separation is found or confirmed by grasping with finger and thumb the fleshy mass of forearm muscle that lies just distal to the lateral epicondyle and by noting which portion of it moves easily across the radial shaft. The mobile portion consists, from before backwards, of three muscles: the brachioradialis and the extensores carpi radialis longus and brevis. The fixed posterior muscle against which they move is the common extensor. The right plane for separation lies between these zones of different mobility and should be sought first distally, near where they part. Deep to them, on the radius, is the supinator muscle—looking, when exposed, like cheap striped suiting—whose superficial fibres must be split to show the nerve crossing their direction.*

(3) Knowledge of this mass of three mobile muscular bellies of the forearm is of use in complete anterior exposure of the radius (Henry 1926); moving them gives the surgeon a tangible *aide-mémoire* for incising skin and fascia before he hooks up and cuts the vascular fan that ties these bellies to radial vein and artery.

(4) In making a medial exposure of ulnar bursa and mid-palmar space (Henry 1939), after incising the skin of the hand along its ulnar edge, one must retract palmwards the mobile belly of the abductor pollicis brevis muscle and then gain access by detaching fibres of the opponens muscle fixed on the shaft of the fifth metacarpal. The reader may test the ease of finding this abductor belly in his own hand, using finger and thumb of the other to move the free border of the hypothenar muscle across the metacarpal shaft.

(5) The radial (or musculospiral) nerve trunk is best found behind the humerus by separating the long head of the triceps muscle from its lateral companion (Stookey and Guild 1919); but, with no better guide than a line, it is easy to miss the plane of cleavage. Luckily the long head is much more mobile than the lateral head and the neighbouring deltoid muscle; it lies behind the deltoid at the outer end of the axillary fold and can there be grasped and moved. Correct incision of skin is now made along its outer edge, and—still with the muscle as guide—the deep fascia is opened. The finger then finds the widish interval between this mobile head and its lateral fellow, and these two separate to form the long strokes of an A pointing distally. The flat nacreous tendon of the teres major muscle crossing their deep surface completes the A. Blunt dissection soon reveals the radial nerve trunk; for, after lying in front of the tendon, the nerve leaves it almost at right angles, dividing the distal part of the A and taking cover near the vertex. The reader, without leaving his chair, can thrust a thumb into the outer part of the opposite arm-pit—letting the fingers lie on the back of his arm—and, even through a coat, take accurate hold of the long tricipital head.

* At the humerus the extensor carpi radialis brevis and extensor communis muscles fuse in a fibrous origin which spreads a dense aponeurosis on the deep face of each muscle. This wash-leather layer makes a loose proximal hood over the supinator muscle and sometimes balks those who begin their search for that striped belly too near the elbow.

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INTERNAL DERANGEMENT OF THE KNEE-JOINT

ABNORMAL COMBINATION OF LESIONS

By E. H. Hambly, M.B. Lond., F.R.C.S.

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A labourer, aged 23, complained of intermittent pain and stiffness in the right knee-joint. Five years previously he had twisted his knee while high-jumping. This was followed by pain and swelling, which was treated by rest. These subsided after a week's treatment. After a year's freedom from symptoms he had another attack of pain and stiffness, which was most felt when walking. For this he received no treatment. A third similar attack developed three weeks before his attendance at the Royal National Orthopædic Hospital.

On examination there was no effusion but there was a slight fullness over the external cartilage. Flexion and extension were limited, and movement produced pain on the outer side of the knee, which was also tender over the external cartilage. A cyst of the external cartilage was diagnosed. Radiography showed osteochondritis dissecans in the medial condyle of the femur.

The patient was admitted to the Royal National Orthopædic Hospital under the care of Mr. R. Y. Paton, who operated on Dec. 14, 1939. The joint was

opened first on the inner side, and a loose fragment 1 in. by ½ in. by ½ in., due to osteochondritis dissecans, was removed from the medial femoral condyle. The internal cartilage was normal. A lateral incision revealed a disk-shaped cartilage of the congenital type—a complete disk, not a meniscus. This was excised, because it was thicker than normal and showed extensive cystic degeneration type, especially along the central and external borders. There was also evidence of osteoarthritis—namely, lipping of

My thanks are due to Mr. Paton for his help and permission to publish this case.

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ACUTE SUPPURATIVE MEDIASTINITIS

REPORT OF A CASE

BY ALEXANDER B. DONALD, M.D. Aberd., D.P.H.
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IN the following case the patient was relieved by an operation which, so far as can be ascertained, has not hitherto been employed in such circumstances.

CASE-RECORD

A man, aged 46, was admitted to hospital on July 31, 1938, with a diagnosis of laryngeal diphtheria. On July 17 he had developed a sore-throat, which kept him off work for a week. On the 25th he reported for duty, but, although his throat was less painful, he complained of slight stridor and looked so unwell that he was sent home for a longer convalescence. For the next few days he was confined to bed; his stridor, loss of voice, and general condition became progressively worse. On the 30th he had a mild attack of dyspnœa, which soon passed off. The next day, however, another attack of dyspnœa became so severe that he called in his doctor, who ordered his removal to hospital.

Previous history.—He had always been very healthy and had not had a day's illness during the past twenty-six years. There was an indefinite history of an attack of rheumatism in childhood but no history of diphtheria.

On examination his temperature was 99·6° F., and his pulse-rate 156. He was cyanosed, and his breathing was very distressed, the difficulty being mainly inspiratory. There was no recession of neck tissues, intercostal spaces, or epigastrium. He sat upright in bed, using his accessory muscles of respiration. His pulse was of good volume. His tongue was clean, and his fauces were clear, apart from a slight redness of the pharynx. His tonsils were not enlarged.

His chest was inclined to be emphysematous and did not move much on his limited inspiration. There was no dullness on percussion. Inspiratory murmur was short, and there was some prolongation of the expiratory murmur. Scattered in all areas posteriorly there were high-pitched rhonchi. No moist sounds were heard. The apex-beat was just outside the nipple line in the fifth interspace and was forceful. The first sound at the mitral area was partially replaced by a rough murmur propagated in all directions; the second sound was sharp and accentuated. Otherwise nothing abnormal was detected. Examination of the abdomen and central nervous system revealed nothing abnormal. There was no swelling of the tissues of his neck, no enlargement of cervical lymph-glands, and no tenderness on deep pressure of the neck. The thyroid gland was not enlarged. The cervical spine moved well, and there was no tenderness on percussion of the spinal column.

Course of events.—It was thought that the attack might be asthmatic, and he was given 1 c.cm. of adrenaline 1 in 1000 but without any alleviation of symptoms. After being desensitised he was given 20,000 units of diphtheria antitoxin by intramuscular injection. He was still in great distress, and at 4.45 A.M. he was given morphine gr. ¼, which was repeated at 6 A.M. along with atropine gr. $\frac{1}{100}$. This gave him some much-needed rest, and by 10 A.M. he could breathe without difficulty, and his colour was greatly improved. Apart from one slight spasm his condition remained satisfactory throughout the day and the following night. Examination at this time revealed some increase in his pharyngitis, but there was still no evidence of diphtheria.

Direct smears gave negative results for Vincent's angina and *Bacillus diphtheriæ*, and a culture from a throat-swab grew no *B. diphtheriæ* but yielded a scanty growth of hæmolytic streptococci and pneumococci. Coarse crepitations were heard at the base of his left lung. His heart remained unchanged. There was still no swelling of the neck, but he complained of slight dysphagia.

Early next morning (Aug. 1) he was still fairly comfortable, and there was no change in his general condition. The blood-count at this time showed 20,000 white cells per c.mm., of which 89 per cent. were polymorphs, 7 per cent. lymphocytes, and 4 per cent. mononuclears. He was seen by the consultant otolaryngolist, who reported that his cords were moving well, but that there was some œdema of the arytenoids. A good view was obtained through the cords, and there was no evidence of any block in the upper part of his trachea.

At noon the patient had an acute spasm of dyspnœa, only partially relieved by sitting up in bed and leaning well forward. He was very cyanosed, but there was no recession of the abdomen or of the neck on inspiration. Coughing, however, caused a slight bulging of the neck tissues. The dyspnœa increased steadily and was unrelieved by morphine or adrenaline. His pulse-rate was becoming more rapid, the volume of his pulse remaining fairly good, but his general condition was very bad, and by 2 P.M. he was exhausted and in extremis. It was decided to do a tracheotomy, but without any real hope of reli ving him.

Operation.—The trachea could be felt only with difficulty, and an incision was made in the middle line of the neck. As soon as dissection had reached the level of the rings of the trachea, about ½ pint of thin green pus came welling from the wound and afforded instant relief. The patient's breathing and colour improved. An artery forceps could be passed downwards and backwards in front of the trachea for about 6 in., and pulsations transmitted from the aorta could be felt. A rubber tube was inserted into the abscess, and the patient was given Coramine 1 c.cm.

After-treatment.—At 3.20 P.M. his pulse was very irregular in volume and rhythm. The apex-beat was 1½ in. outside the nipple line. His breathing was of the Cheyne-Stokes type, and he appeared to be in "coma vigil." He was given digitalin gr. $\frac{1}{100}$ four-hourly and oxygen through a nasal catheter, which improved his general condition slightly. He was mentally vague and had no recollection of the past four hours. He was put on sulphanilamide 1·5 g. four-hourly.

By 5.30 P.M. his condition was much improved, breathing was normal, and his pulse was regular. Cyanosis was slight, but he was rather grey. Mental condition was still confused, but he was quite cheerful. Pulse was r gular and volume fair and well sustained. A pure culture of hæmolytic streptococci was obtained from the pus.

Next day (Aug. 2) his general condition was much improved; his facies remained rather grey and slightly cyanosed, but his breathing was unobstructed. His pulse was less rapid but rather bounding. There was a fair amount of discharge from the wound. The apex-b at was still 1½ in. outside the nipple line and rather diffuse. His first mitral sound was still replaced by a rough systolic murmur. At this time he had many crepitations in both lungs, and his sputum was rather rusty.

On the 3rd there was occasional coupling of his heart beats, and he was taken off digitalin. On the 4th his temperature had settled, pulse was irregular but not rapid, and colour was still rather grey. Prof. W. T. Ritchie, who was consulted, diagnosed myocarditis and pericarditis. He gave a favourable but very guarded prognosis and advised that the administration of digitalin should be continued four-hourly.

Subsequent progress.—From then on the patient made slow but steady progress. His pulse, however, remained irregular for some time. The wound in his neck discharged until the 22nd, when it began to heal. The pericarditis continued until about the same time, when the apex-beat was found to have returned to the nipple line. He was allowed up for a short time on Oct. 29 and made rapid progress until his discharge on Nov. 19, when a rough systolic murmur was still present. His neck had healed well, and his general condition was very satisfactory.

DISCUSSION

Infection of the posterior mediastinum commonly follows rupture of the œsophagus or less often is secondary to infection extending from some other locus, such as neck, spine, lungs, and suppurating lymphatic nodes in the posterior mediastinum. Keefer (1938) points out that signs and symptoms are indefinite, and that abscesses of the posterior mediastinum may be very large before producing any signs. In the case described above infection appears to have spread from the pharynx to the lymphatic nodes at the bifurcation of the trachea, where suppuration developed. It is possible that the suppurating nodes caused obstruction to the breathing on July 30, and that, after the rupture of this circumscribed abscess into the posterior mediastinum, relief was obtained, which was short-lived, however, for dyspnœa returned within thirty-six hours. Neuhof (1936) emphasises the importance of a deceptive remission in several of his cases and the danger of interpreting remission as a sign of spontaneous cure. Radiography was not possible to verify the diagnosis, but there can be little doubt that the pus was situated deep to the pretracheal fascia, which prevented extension of pus in the neck because of its attachment to the thyroid cartilage above and to the fascia of the great vessels of the neck laterally. The pretracheal fascia is adherent to the posterior parietal pericardium in the mediastinum, and thus there is a great liability to infection of the pericardial sac. In most of the reported cases dysphagia was the commonest symptom, but in this case dysphagia was slight and dyspnœa severe, with little disturbance of circulation until the late stages. Although the case-mortality of mediastinal abscess is high, cure may follow spontaneous rupture into a bronchus or surgical removal of the second, third, and fourth ribs posteriorly with subsequent drainage. The method of evacuation of the abscess in this case was much less mutilating than the usual operation of rib-resection, and, in view of the fascial planes in the mediastinum and neck, it is suggested as a primary operation for suppurative mediastinitis, the major operation being reserved for use ir the pus does not drain properly. A radiogram would give valuable information about the upper limits of the abscess and would help the surgeon to decide which was the better method of approach.

SUMMARY

A case of acute suppurative mediastinitis, complicating streptococcal pharyngitis, was relieved by incision of the pretracheal fascia.

I wish to express my thanks to Dr. Alexander Joe, medical superintendent of the Edinburgh City Hospital, for permission to publish this case, and to Prof. W. T. Ritchie for advice on the medical post-operative treatment.

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MEDICAL SOCIETIES

ROYAL SOCIETY OF MEDICINE

SECTION OF PSYCHIATRY

AT a meeting of this section held on Jan. 9, with Dr. F. L. GOLLA, the president, in the chair, a paper on

Electrically Induced Convulsions

was read by Mr. W. GREY WALTER, who had written it in collaboration with Dr. Golla and Dr. G. W. T. H. Fleming. He said that if a small electrode is applied to an exposed portion of brain tissue, a maximal response is obtained with a few milliampères. To obtain between 5 and 10 ma. in the cortex through the resistance of the skull and surrounding tissues, it is necessary to apply a potential of about 100 volts. Resistance of organic tissues is not constant and therefore Ohm's law does not apply; the current itself, for instance, lowers the resistance. Other variables have to be considered, such as wave form and frequency. Cerletti and Bini used the ordinary 50-cycle alternating current from the mains, which provided a complete and adequate stimulus that seemed to do no damage. The current is attenuated not merely by pure resistance drop but also by its spread through the conducting tissues over an area much larger than the electrodes. The usual duration of the shock is between 1/10 and 1/5 sec. The patient's resistance varies between 400 ohms and 900 ohms, with an average of 750 ohms; there seem to be two groups of patients, one with high and one with low resistance. A typical oscillograph tracing of the shock shows six negative and five positive pulses, and therefore each hemisphere receives about five supramaximal stimuli. The alternation of the current is probably the safeguard: a direct current of the same magnitude would be disastrous. A more efficient stimulation might perhaps be obtained by the use of a lower frequency—one more like that of the brain current during a fit. The tension used might then be less, and an exploratory electrode might perhaps be used. The first effect is a lowering of electrical resistance. In a patient with high resistance it is lowered by about 50 per cent. and is recovered slowly; in a patient with low resistance it is lowered very little and is recovered in a few minutes. If the first shock fails to produce a major fit a second may succeed, for it will have a greater effect. The shock is followed by a long latent period, especially if it is only just sufficiently intense. The electromyographic record is much the same as those obtained in spontaneous and cardiazol fits. The electro-encephalogram shows the repetition of a small rise and a sudden breakdown followed by a number of oscillations. The shape is remarkably stereotyped. The breakdown synchronises with a discharge in the flexors and extensors. Mr. Walter showed a film illustrating the apparatus, the fit and its results.

Dr. FLEMING pointed out an important difference between the shock-induced fit and an attack of

idiopathic epilepsy: the shock is followed at an interval of less than 1/10 sec. by a start in all four extremities. The intensity of this start does not depend on the size of the current; it is probably due to direct stimulation of the motor cortex. In the cardiazol fit it is replaced by a series of convulsions. The tonic and clonic phases appear to be identical with those of the true epileptic fit, but are far less intense than those evoked by cardiazol. The long latent period of the cardiazol fit, during which the patient struggles violently, is absent in the electrically-induced fit. Whereas many patients are extremely terrified of cardiazol, none mind the repetition of the shock treatment, for it produces instant unconsciousness and retrograde amnesia for the few seconds before the shock. Dislocations and fractures are common in the cardiazol fit but rare after electric shock. If convulsion therapy is a uniquely valuable curative agent, it should not be withheld because of these non-lethal dangers. Every patient has his own stereotyped form of postepileptic behaviour—e.g., rhythmic movements, utterances or sleep. There are no symptoms of respiratory failure or cardiac distress. The apparatus is inexpensive and its use does not call for high technical skill.

Dr. W. H. SHEPLEY described the apparatus, in which the resistance can be approximately measured by a weak current before the shock circuit is closed. The duration of the shock is predetermined and controlled by a time-switch. At Warlingham Park Hospital, he said, an attempt was made to control the spread of the current by the use of a conducting paste between the electrodes and the head. He prefers to increase the magnitude of the shock by time rather than voltage. Paraldehyde or Epanutin increases the resistance. The heart appears to stop at the moment of the shock. Electrocardiographic readings (which of course cannot be made at the instant of shock) show an increase in the amplitude of the ventricular complex of the order of 0·2 mV. In the flaccid stage immediately after the fit the increase is so great that the beam of the cathode ray leaves the fluorescent screen: perhaps not only the head but also the body becomes charged like a condenser. Fits can be induced in patients comatose from insulin without untoward result, but a wet patient should be sponged dry, and wet bed-linen changed. A long latent period—30 sec. or more—is common in these patients, and the fit may be atypical. The patient tends to come out of the coma, and the blood-sugar is increased by 10–15 mg.; bile appears in the gastric juice. Patients who have not responded to cardiazol do not respond to the electric shock, and vice versa. Where maintenance treatment is required the new method has the advantage that patients will not refuse it and that it can be given to outpatients. Therapeutic results and indications are not yet fully understood. Chronicity seems to be unfavourable. Among the shock-resistant types are true endogenous schizophrenes, who are mostly of very inferior constitution, and patients with fixed delusions. Where, however, a fixed delusion has resulted from alteration of feeling-tone, convulsion-therapy may remove it. True manic-depressives of an affective cyclothymic type react badly, with signs of physical shock; they do not belong to the cortical-inhibitory type for whom convulsion-therapy seems best indicated. This type includes a group largely composed of dyskinetic schizophrenes, some of whom are stuporose, and a wider group of schizoid depressives whose depression has a persistent and malignant quality. Precise indications for the time and frequency of application relative to the phase of the illness require to be worked out.

Dr. L. B. J. KALINOWSKY summarised the work of Cerletti and Bini in Rome on over a hundred patients. They observed complete recovery in nearly 80 per cent. of patients who had been ill for some six months; only a third of cases of one to three years' duration showed full recovery. The optimal effect has been produced in recent cases after 15 complete and 4 incomplete fits. There has been no striking difference between various groups of schizophrenes in the quality of the results. Even more surprising reactions are obtained in the depressive phase of manic-depressive psychosis. The systolic blood-pressure rises immediately after the fit and falls to normal in thirty minutes; the pulse-pressure is considerably increased. No tendency to anæmia has been observed. Neither fractures nor dislocations have occurred—perhaps because the convulsions take place in a relaxed patient. No cerebral complications have been seen. A large number of fits have now been produced in Italy without accident. The most usual voltage used is 80–100 and duration 1/10 sec.

Dr. D. A. S. BLAIR said he had not noticed that the automatic conduct changes as the patient benefits by the treatment. He cannot correlate this behaviour with various types of psychosis; evidently the neuronic activity varies from case to case. He has been disappointed to find that vertebral fractures occur. He commented on the considerable discrepancy between the prices charged for apparatus by various manufacturers.

Dr. ISABEL WILSON asked which type of attachment is most efficient for the electrodes, the elastic band or the pincers.

Dr. C. R. BIRNIE objected to the use of the term "therapy" in this connexion. Results are not yet attainable which justify any claim for the efficacy of the method. An extensive survey in America showed that the aggregate results of cardiazol treatment have not improved on the normal remission rate. This is only to be expected. The psychoses which are treated are complicated biological reactions of a personality to the environment. They probably represent an attempt of a failing organism to make an imperfect adaptation. The inhibition of certain types of schizophrene is probably an attempt of nature to repress certain unconscious urges with which consciousness is unable to deal. Convulsant treatment releases these urges and allows them to flood the consciousness; there is no reason to suppose that the consciousness is any more able to deal with them afterwards. Before this apparatus is introduced into mental hospitals on a large scale, more accurate information about the results of treatment is necessary. He doubts whether reported remissions are necessarily complete. Intelligence tests on supposedly cured patients have convinced him that real intellectual defect remains. On humanitarian grounds he feels that mental patients are in danger of having a pretty thin time. He pleaded for scientific prudence before these forms of therapy are accepted as a panacea for all the psychoses.

In reply, Mr. GREY WALTER suggested that the placing of the electrodes need not be very precise; the apparently low tensions recommended by the Italians may be explained by differences in method of measuring alternating current.

DOCTORS' FAMILIES IN FINLAND.—The Norwegian Medical Association is taking steps to provide homes for the children of Finnish doctors. Norwegian doctors have notified their willingness to put up some 250 children of their Finnish colleagues should they find it necessary to part with them temporarily, and 50 Norwegian non-medical homes are also joining in the scheme.

REVIEWS AND NOTICES OF BOOKS

The Newer Knowledge of Nutrition

(5th ed.) By E. V. McCOLLUM, Ph.D., Sc.D., LL.D., professor of biochemistry, School of Hygiene and Public Health, Johns Hopkins University; ELSA ORENT-KEILES, Sc.D., and HARRY G. DAY, Sc.D., associates in biochemistry in the same school. London: Macmillan and Co. 1939. Pp. 701. 18*s*.

DIETETICS advance so swiftly that this edition has had to be entirely rewritten. The formidable task has been undertaken so successfully that no earnest student of the subject can afford to neglect the result. The majority of the book is theoretical. Of the 28 chapters, 23 deal either with the history of dietetics or with proteins, fats, carbohydrates, inorganic elements and vitamins, and only the last 5 with practical applications. For these last chapters alone the book would be worthy of careful perusal. McCollum and his colleagues have managed to keep their heads completely. For instance, they recognise the danger of the excessive use of refined flour and other cereals and sugar but they say, "There is no valid objection to the use of these foods in certain quantities, provided they are supplemented with sufficient amounts of the protective foods, namely, milk, eggs, leafy vegetables and meats." They are sceptical of the value of instinct in teaching animals and human beings what foods they should eat. They ask champions of the reliability of appetite as a guide to food consumption to explain why a flock of chicks will fill their crops with grains of rocksalt where an ice-cream freezer has been emptied, and, as a consequence, quickly pass to their avian award; they sum up with, "But there is a preponderance of evidence that in humans appetite generally is not a reliable guide to physiologic need." "Conscientious and thoughtful nutrition investigators," they say, "regard the application of the knowledge of nutrition to clinical problems as a responsibility to be shared by both the clinician and nutrition specialist. Without this attitude of mutual dependence, mistakes of over-enthusiasm and misinterpretation of facts are likely to occur." As might be expected from this they are not over-enthusiastic for the high intake of vitamin B_1 widely recommended, and they incline to the figure of 300 I.U. per day suggested by Cowgill. Incidentally, when they say that Baker and Wright claim that they have observed actual cases of beri-beri in persons whose diets presumably contained over 300 I.U. per day, they are probably misinterpreting the paper they are quoting. The book (despite incursions into the more frivolous) is rather heavy reading, especially in the earlier chapters, but as the authors warm to their task it becomes much more readable.

Dissociation of Tubercle Bacilli

Investigations on the mammalian types including B.C.G. By J. FRIMODT-MÖLLER. London: H. K. Lewis and Co. 1939. Pp. 256. 12*s*.

THIS is a record of part of an extensive investigation carried out at the tuberculosis department of the Copenhagen State Serum Institute under the supervision of Dr. K. A. Jensen. In 1927 Petroff first described the dissociation of strains of bovine, avian and B.C.G. types. Subsequently he and his co-workers suggested as a result of these investigations that two types of colonies could be dissociated from B.C.G. cultures, one (R) waxy looking, with elevated folds, growing best on Sauton's medium at pH 6·4, brittle and difficult to emulsify, the other (S) having a flat finely granular colony, growing best at pH 7·6, and possessing greater virulence. Petroff therefore concluded that the B.C.G. strain, by reason of this dissociation, was liable to produce dangerous results. He even went so far as to claim that the Lubeck disaster, in which a number of children died following prophylactic vaccination by the mouth, was due to this, although the evidence before the court of inquiry in Germany showed that the fatalities were caused by accidental contamination with a virulent human strain (Kiel). The subject has recently been advanced a stage further by Steenken who prefers to call the R colony Ra (avirulent) and the S colony Rv (virulent) in order to avoid confusion with the nomenclature of R and S used for other organisms with which the tubercle bacilli colonies are not comparable.

Dr. Frimodt-Möller set out to investigate these dissociation phenomena with strains of tubercle bacillus which come from the daily routine work of his Copenhagen Institute, the technique of isolation and type determination used being that of Jensen. B.C.G. cultures were also examined. By cultivation on Lowenstein's egg medium with 0·75 per cent. glycerin certain dysgonic strains with guineapig and rabbit virulence conforming to the human type were obtained, and colonies of these strains displayed dissociation. But the author states that the work has not brought us nearer to the question of what actually produces and causes the appearance of secondary eugonic forms. The book is a record of painstaking research which will be of great value to the systematic bacteriologist.

Pulmonary Tuberculosis

A Synopsis. By JACOB SEGAL, M.D., physician in charge of the Fordham Hospital tuberculosis clinic, New York; associate visiting physician to the Riverside Hospital, New York. London: Humphrey Milford, Oxford University Press. 1939. Pp. 150. 10*s*. 6*d*.

THIS little book gives a short account of pulmonary tuberculosis based on the author's own experience. It contains nothing new and a similar venture has often been attempted by others, but there is always something stimulating in a fresh journey over familiar ground. Dr. Segal has gone one better than the authors of more detailed monographs in the amount of space he gives to the psychological aspect of the treatment of phthisis, for the patient's outlook towards his affliction is greatly influenced by the attitude of his physician. The book, which can be read in one evening, will go far to convince a sceptical general practitioner that much can be done for the consumptive today and not all of that by the specialist.

A Textbook of Anatomy and Physiology

(6th ed.) By JESSE FEIRING WILLIAMS, M.D., Sc.D., professor of physical education, Teachers College, Columbia University. London: W. B. Saunders Co. 1939. Pp. 607. 12*s*. 6*d*.

MOST combined textbooks of anatomy and physiology show a bias toward one or other subject, and in this case anatomy is favoured. The book contains an amazing amount of detail, so that although it is written in a lucid style every line has to be read carefully. It is profusely and clearly illustrated, contains a large number of tables of classified data and a comprehensive glossary. The total effect is impressive but it is difficult to decide the type of student who would benefit by it. It is too condensed for the beginner unless he is provided with ample collateral instruction and inadequate for the medical student; with care it might be used for reference and

revision by the senior student of nursing or physical training. Each chapter contains instructions as to methods of study with appropriate questions. This rather suggests a type of correspondence-course instruction, a practice quite foreign to the methods of scientific teaching in this country. The virtues of the book are many. It is accurate and up to date though condensed, it contains a preliminary account of development in all sections, and it does try to weave structure and function into a living whole.

Manual of Urology

(2nd ed.) By R. M. LE COMTE, M.D., F.A.C.S., professor of urology, Georgetown University medical department. London: Baillière, Tindall and Cox. 1939. Pp. 295. 18s.

THIS work has been written mainly to give the medical student a knowledge of the fundamentals of urology. It therefore deals with broad principles of diagnosis and treatment rather than practical details. So many advances have been made in urology since the appearance of the first edition in 1933 that almost every chapter has had to be rewritten and many new sections added. An entirely new chapter on sterility and impotence has also been inserted. American books are as a rule not only well but even sumptuously illustrated, a quality that adds to their utility but unfortunately also to their cost. In this case the price of the book has been maintained at a high level although the illustrations are of poor quality. The line drawings might well have been supplemented by a few plates dealing with pyelography, for example. Nevertheless, the senior student doing practical work in the urological department will find the book invaluable.

Les maladies du larynx

clinique et thérapeutique. By G. CANUYT, professor of oto-rhino-laryngology in the Faculty of Medicine of Strasbourg; with the collaboration of PAUL TRUFFERT (Paris), JEAN TARNEAUD (Paris), and CH. WILD, (Strasbourg). Paris: Masson et Cie. 1939. Pp. 814. Frs.270.

THIS is the fourth of a series of large-scale monographs dealing with diseases of the nose and throat. The paper, type and format are all excellent, but the illustrations are not always good, the reproductions of many of the radiograms being especially poor. There is some lack of balance. For instance, the operation of tracheotomy is described in great detail and illustrated by twelve almost full-page figures, whereas the various methods of partial and complete laryngectomy are briefly dismissed in the text and not illustrated at all. In describing the treatment of laryngeal stenosis Schmiegelow's work is described only once on an insignificant point (and then inaccurately), and his method of dilatation by elastic pressure is almost entirely ignored. Again, Haslinger is responsible for the account of direct laryngoscopy and naturally describes his own instruments. These are unquestionably excellent, but most laryngologists nowadays use some form of instrument with distal illumination. The plan of the book is unusual but sound and satisfying. It consists of three parts. The first deals with indirect and direct examination, including radiography, with a description of tomography. The second sets out the pathology of the various diseases of the larynx with clinical accounts of each. These are well and sometimes almost dramatically written and illustrated and a pleasure to read. No mention is made in the chapter on cancer of the larynx of Broder's method of grading the malignancy of the growth and of its value in treatment, although there is a short paragraph on the qualitative aspect of the histological appearances. In fact, there is a slight tendency throughout to quote French authorities somewhat to the neglect of others. The sections on treatment are full and satisfying, except for the descriptions of operative procedures. An interesting feature of the book is its third part, in which affections of the voice are described and classified and the appropriate treatment discussed. This is a neglected branch of the specialty, often in the hands of unqualified or poorly qualified men because no adequate teaching is available for the post-graduate student. Here is assembled much valuable information concerning disorders of the vocal function of the larynx, including methods of examination. Great stress is laid on stroboscopy and the technique and interpretation of results is fully described. There is also a detailed account of methods of voice production and re-education. The book acquires a distinctive character from the presence of these chapters, and every laryngologist will derive pleasure and profit from reading them. The most serious and inexplicable defect of the book is the absence of an index.

Clinical Diagnosis by Laboratory Methods

(9th ed.) By J. CAMPBELL TODD, Ph.B., M.D., late professor of clinical pathology, University of Colorado school of medicine; and ARTHUR HAWLEY SANFORD, A.M., M.D., professor of clinical pathology, University of Minnesota (Mayo Foundation). London: W. B. Saunders Co. 1939. Pp. 841. 27s. 6d.

THIS is a valuable reference book for students, teachers, and laboratory workers, simple qualitative tests being described as well as the more complicated and technical biochemical and bacteriological quantitative methods of analyses. Among the new tests described are the determination of serum lipase, ascorbic acid and sulphanilamide in blood and urine. It includes comprehensive chapters on clinical chemistry, bacteriology, hæmatology, and serodiagnostic methods, all brought thoroughly up to date.

Some Unrecognised Factors in Medicine

London: Theosophical Research Centre. 1939. Pp. 254. 5s.

A GROUP of students, some of them medically qualified, met with the idea that they might "align the older and traditional theories, of Hindu tradition in particular, with some of the modern Western theories." This method has produced a serious study of a difficult subject, and the first question it evokes is not whether such an alignment has been successful but whether it is desirable. The two methods approach the healing art from fundamentally different standpoints, and while each may be effective in its own field, any attempt to combine them may be fruitless. The second question is whether ancient Hindu methods of healing can be usefully applied by anyone brought up in the Western tradition. Hindu teachers of Yoga regard the task as beyond most Europeans, since it implies the approach to life from an Eastern standpoint. Putting aside these two problems it must be said that the book is stimulating in its attempt to explain healing, by other than the ordinary methods, in terms that are understandable to Western minds. It introduces the reader to methods of diagnosis and treatment, not yet explained by medical science, which have proved effective when used by certain people in suitable cases. If the study does no more than suggest avenues for further investigation it will not have failed in its purpose.

THE LANCET

LONDON: SATURDAY, JANUARY 20, 1940

THE CASE FOR A REHABILITATION BOARD

IT has long been felt that the extensive panoply of tuberculosis treatment in this country is not producing, and cannot be expected to produce, wholly satisfactory results in the absence of an effective aftercare organisation. This is not to say that aftercare has been neglected. On the contrary, considerable sums and much devoted service have been applied to it. But counsels have been divided, as was frankly admitted by the deputation to the Minister of Health last October,[1] and action has accordingly been paralysed. Palliatives have been adopted pending agreed solutions. Meantime those who would rightly be shocked to see sufferers from small-pox at large in the streets show a surprising complacency regarding the presence of tens of thousands of sputum-positive cases amongst the general community, and it is still insufficiently realised that even the most sympathetic employers will not engage ex-sanatorium patients if alternative labour is available. The most comprehensive single effort to deal simultaneously with every aspect of the tuberculosis problem is the Papworth village settlement: and its successful development during the past 25 years has won strikingly unanimous commendation from both medical and non-medical observers. It has been said, however, that its capital cost was so large as to preclude its adoption as the basis of a national aftercare organisation. This view was strenuously resisted by its advocates, who marshalled impressive rows of figures in support of their contentions; but medical men are perhaps not at their best in arithmetic, and although Papworth was recognised on all sides as the ideal solution of the tuberculosis problem it certainly looked expensive. Its hospitals, each bigger than the last, its workshops, ever acquiring new and better machinery, its multiplying hostels and cottages, its general air of hope and vitality, all betokened capital expenditure; and despite Ministerial exhortations to go and do likewise, local authorities and other bodies engaged in combating tuberculosis have for the most part hesitated to deploy their talents and finances in this direction.

Lord WILLINGDON'S article in the *Times* of Jan. 13 will therefore be read with particular interest. In it he has posed a variety of troublesome public-health problems and propounded solutions which are worth more than cursory examination. "Large sums," he observes, "are being spent upon the treatment, and even upon the subsequent training of sufferers; but although medical science has achieved wonders in restoring working capacity impaired by sickness or accidents, there is no national scheme for converting that restored capacity into wages." That, of course, is the whole crux of the question of tuberculosis aftercare. Working capacity which cannot be converted into wages is, for practical purposes, useless. It is indeed a mockery, and the cause of infinite discontent and disruption. After touching briefly on the enormous waste caused by lack of such a conversion scheme, Lord WILLINGDON deals rapidly and trenchantly with the respective merits and demerits of voluntary and state control of the health services with particular reference to rehabilitation; and concludes by recommending a scheme put forward by Sir PENDRILL VARRIER-JONES and Mr. REYNELL WREFORD (a senior executive of the village settlement organisation) to a Government committee in 1936. This scheme—in principle the same as that submitted by the same authors to the Ministry of Health in 1930—proposes the formation of a National Rehabilitation Board to operate as a public utility on the lines of the Electricity Board. The income of this board would be derived from the sources which are at present dispensing unemployment and health benefits, and its function would be to provide, on a national scale, the link between working capacity and the opportunity to earn. By this means it is claimed that the disabled would be converted from a liability into an asset, and that the ultimate saving would be enormous. As a demonstration of the way in which the scheme would work, Lord WILLINGDON then quotes an extract from the 1938 Papworth report which bears directly on the scheme:—

> "So far as we can estimate," runs the extract, "the men, women, and families, now settled at Papworth would be drawing £17,500 a year in unemployment benefit if they were not at Papworth. Instead, they paid, in 1938, £1090 8*s*. 1*d*. into the Government insurance funds, while Papworth Industries, as their employers, contributed a further £1131 14*s*. 3*d*. Given this annual £19,722 2*s*. 4*d*., Papworth could provide the service of a 60-year 3½ per cent. loan more than large enough to build the entire settlement. And our people are receiving more than £40,000 a year in wages, whereas if they were unemployed they would only be drawing some £17,500. That difference of £22,500, coupled with the low rents charged, means that the disabled at Papworth really have a chance of finding life worth living, and of bringing up their families free from those diseases which—like tuberculosis—find easy victims among the underfed, underclad, and undernourished."

In brief, as the leader-writer of the *Times* puts it, "Lord WILLINGDON urges that the money now being spent unproductively should be applied to the service of rehabilitation loans." This is an excellent and practical suggestion, and it disposes in an instant of the idea that the Papworth scheme is expensive. In fact it saves more than it costs, for if it were given the benefit of its own savings it would be self-financing. At present it does not get this benefit. In consequence it is compelled to beg for every penny of capital, and it is this unfortunate fact which cramps and limits its development. Since the effect of limiting its development is to thrust still further maintenance burdens upon the state there appears to be every reason why—especially at the present time—the cause of this limitation should be removed without delay.

1. *Lancet*, 1939, 2, 1001.

The proposed National Rehabilitation Board would not confine its activities either to tuberculosis or to village settlements such as Enham. The *Times* has already suggested other classes of disabled people who would derive great benefit from large-scale rehabilitation on Papworth lines; and there is no apparent reason why local workshops, managed as part of the board's industries, should not replace village settlements where no necessity for segregation exists. The beneficent possibilities of the scheme are indeed endless, and bearing in mind that it would not only eliminate much waste and misery, but also mobilise the unfit in the interests of the nation, we hope that the Minister of Health will lose no time in conferring with the Papworth authorities and with the various other interests concerned. These are many and diverse, for the insurance companies, friendly societies and trade-unions, as well as the local authorities and the state insurance funds all stand to gain from its adoption. But there should be no undue delay, for delay means waste and in war-time waste is a crime.

RATIONS FOR INVALIDS

Correspondence between Mr. WILLIAM LEONARD, M.P., and the Minister of Food [1] has again drawn attention to the claim of invalids to special rations. The official attitude is that no extra rations are justified, though the ministry has promised that a committee of medical experts will examine the subject. It is to be hoped that this committee will meet soon and report rapidly, for even the present mild rationing of butter, bacon and sugar may lead to hardship. There is some justice in Mr. LEONARD's suggestion that pending the report all invalids should be entitled to their accustomed quantities of food on presentation of a doctor's certificate.

Diabetes is more in the mind than any other disease, for diet is an essential part of its treatment. Of the three restricted foods, bacon and butter enter into the diet-scheme of a diabetic. Bacon is useful because it contains protein and fat without any carbohydrate, while butter consists of fat with minimal traces of protein and carbohydrate. When the dietitian is working out the menus of a diabetic these two foods are godsends in making up deficits of protein and calories without increasing carbohydrates. Cheese can replace bacon, and margarine (if vitaminised) can replace butter; but it is a hardship to a diabetic whose diet has been worked out for him to swing over to cheese, particularly if he has to limit his intake of bread. The Minister of Food's answer is presumably based on the possibility of increasing the insulin injected to cover a greater amount of carbohydrate made necessary by rationing. But few doctors would be prepared to recommend an elderly diabetic whose blood-sugar can be controlled by diet alone to begin insulin and increase his carbohydrates.

There are other conditions besides diabetes in which diet is of prime importance—convalescence and tuberculosis in particular, though there are many others. Here the rationing of bacon, butter and sugar does not hit very hard. Digestible foods with high amounts of vitamins are needed, and of the three foods only butter contains much in the way of vitamins, though bacon is a valuable source of vitamin B_1. Still, even here, the Ministry of Food should walk warily. Until it has made the vitaminisation of margarine compulsory, and raised the proportion of vitaminised margarine from the present 75 per cent. to 100 per cent., it had better not pretend that "supplementary rations under modern conditions of treatment are not necessary." In framing its regulations the ministry should remember that the least intelligent members of the population are the most likely to suffer from dietetic deficiencies.

1. *Times*, Jan. 13, 1939, p. 3.

SPECIES

MOST of us have a powerful urge to assign as much as possible of our knowledge and experience to watertight compartments and to regard these compartments as inherent in the nature of things. This urge, which Prof. A. D. MEAD in an address last summer [1] to the graduates of Brown University called the "species complex," has always been a potent factor in hindering the advance of knowledge. Professor MEAD was concerned mainly with its disastrous effect on education. We have advanced considerably since the days of which "1066 and all that" is hardly a parody, but there is still a tendency to consider the pigeonholing of knowledge as more important than the knowledge itself. It is often maintained that, in the early stage of a subject, dogmatism is essential for the sake of clarity, to be followed later by disillusionment when the uncertainties are realised. Unfortunately this second stage, which alone has the right to be called education, is rarely reached even by teachers themselves. In the biological sciences the natural variability of living things makes it particularly difficult to classify their subject matter, and most biologists now agree that the term species can have no precise meaning. Before the rise of modern genetics and the chromosome theory two types of variation were recognised—those due to environmental factors and easily reversible, and those more permanent variations due to differences in hereditary make-up. This distinction, inherent in the problem of "nature and nurture," is of immense importance especially in medicine, but in the past it has been difficult to draw and has caused much confusion in classification. Genetics is now coming to the rescue. It has introduced the conception of the "genotype" or hereditary constitution, definable in terms of genes and capable of experimental analysis, which may undergo modifications known as mutations. The genotype expresses itself finally as the "phenotype" or complex of characters which constitutes the organism. But the phenotype derived from a given genotype will vary within limits as the result of environmental conditions, particularly during development. To determine the hereditary

1. *Science*, 1939, **90**, 241.

constitution of an organism therefore necessitates rigid control of the environment.

The theory of evolution encourages the assumption that if all the organisms which ever existed were available for detailed study it would be impossible to arrange them into discrete groups distinguishable by well-defined hereditary constitutions. It is, however, obvious that between the major groups of existing animals and plants hard and fast lines can be drawn. Every vertebrate animal can, for instance, be assigned to one or other of the established orders. This, as palæontology shows, is due to extinction of intermediate types, but is none the less a valid basis for classification. But when we come to smaller and smaller categories and finally to species, subspecies and varieties it becomes more difficult to find adequate criteria for classification. This is only to be expected if evolution, whose basis is the variability of the individual, is still proceeding. Though this difficulty has always been recognised, the idea has been long in dying that the term species should be made to bear a definite meaning, that it should in fact apply to the lowest category in the hierarchy of classification which can be rigidly defined on the basis of hereditary characteristics. Interspecific sterility is another criterion, though rarely has any attempt been made to verify it.

Modern genetics has now made clear the futility of this idea. In genetical terms the members of the same species should have a relatively stable hereditary constitution which can be determined by breeding and examination of the chromosomes. This should differ in a well-defined manner from that of other species. It is certainly true in general that the greater the divergence of two species in respect of bodily characters the greater their difference in hereditary and chromosomal make-up. But on this basis there is no criterion by which species can be defined. The genetic differences between species are of several kinds, but they are of the same nature as those which separate varieties within a species. It is simply a matter of degree. On the question of interspecific sterility genetics has also thrown much light. Sterility on crossing two species implies failure to produce completely functional hybrid offspring. The breakdown may occur at any stage between fertilisation of the egg and the production of functional gametes by an otherwise normal hybrid, as in the mule. This breakdown can now in most cases be explained as due to an upset in the chromosomal mechanism resulting from a mingling of two incompatible sets. But recent research has shown that hybrids between recognised species are not necessarily sterile and that sterility depends on the kind and degree of divergence of the chromosomal complements of the two species. In certain cases only a proportion of the hybrid offspring are sterile; in fact, it is now certain that some species of plants have been produced naturally and in the laboratory by hybridisation of two other species. The arbitrariness of interspecific sterility as a criterion of species is further shown by the fact that hybrids between varieties of the same species are often sterile. Interspecific sterility is thus an incidental but not an inevitable result of genetic divergence, though, like geographical isolation, it undoubtedly favours further divergence.

We are thus led to the conclusion that the term species can have no rigidly definable meaning. Nutritional or other physiological experiments with animals, for example, cannot be adequately controlled merely by using one species only: a genetically homogeneous stock must be obtained. Nevertheless, the concept of species remains useful, and indeed necessary to biology if its fluidity is realised.

THE YOUNG VISITORS

"I would like to see a great development of what I should call residential nursery schools. Of course that would involve a lot of money, but then, if the war is going to last three years, billeting these children is going to cost a lot of money; and if you had the residential nursery schools you would have a permanent asset of enormous value. Merely to set up such schools and to get them staffed with the right kind of people would be the very means to secure the confidence of the mothers who at present are taking their children back to the towns with them. I have the greatest sympathy with the mother who does not want to leave her under-fives in the hands of strangers."

Thus Lord Balfour of Burleigh in a debate on evacuation problems.[1] But in a letter to our own columns [2] Dr. John Rickman wrote of the strain imposed on a young child by separation from his mother. The Board of Education and the Ministry of Health seem to have listened to both before issuing their circular [3] to local education authorities and local authorities urging them to set up nursery centres, which they describe as "something between a day nursery and a nursery school," for children between the ages of 2 and 5. It is proposed that the children should meet in groups of 10 to 20 for the ordinary sessions of an infant school, under the care of a warden who need not necessarily be a qualified teacher. Large single empty rooms, which could probably be secured rent-free, would provide the necessary accommodation; each child must have a floor-space of at least 15 sq. ft., and access to warm water. A superintendent, who should be a trained and experienced nursery-school or infants teacher, would supervise the work of four or five centres, and regular visits would be paid by doctor and nurse. Under this scheme the children would return home for their meals, but the hostess who provides food, cleanliness, warmth, and a comfortable bed would not have to find the energy or space to cope with the ceaseless activity of young children so long as they are awake. At these centres the children would be able to live the kind of life that is interesting to them, though it is not always acceptable to grown-up people. The suggestion seems to be a step taken, as inexpensively as possible, in the right direction.

(1) Parliamentary Debates: House of Lords. Official Report, 1939, 114, 1612 (Nov. 1).
(2) *Lancet*, 1939, 2, 1192.
(3) B. of E. 1495: M. of H. 1936.

ANNOTATIONS

MELÆNA IN CHILDHOOD

THE presence of blood in a child's motions is often alarming to the parents and puzzling to the medical practitioner. First in time comes the melæna of the newborn, nearly always controllable by injections of adult blood and offering a new field for therapy by vitamin K, according to Dam and co-workers.[1] Among the simple causes of melæna in later infancy and childhood Little[2] of London, Ontario, classes the slight, painless tear of the rectal mucosa caused by a hard stool; the extremely painful fissure-in-ano; the rectal polyp, usually easy to feel; the prolapse of the rectum, easy to see; and the single external pile, which is the only common type of hæmorrhoids in the child. Another group mentioned by Little comprises those forms of acute inflammation of the bowel in which not only blood but mucus, pus and bile are all present and the child is acutely ill with vomiting and high fever. Such cases are rightly dreaded at a children's hospital because of the high risk of infection. Intestinal hæmorrhage is a common feature of certain blood dyscrasias such as leukæmia and thrombocytopenic purpura. The bleeding occasioned by acute intussusception is classical but Little points out the danger of assuming that complete obstruction is always an early result of this disorder. A small amount of fæcal matter often continues to appear in the stool, especially in children past their infancy who give a history of recurring abdominal pain for several days, with loss of weight, blood and mucus in the stools and an abdominal tumour which varies in firmness on palpation.

The chief value of Little's contribution lies in his description of intestinal hæmorrhage as a common complication of Meckel's diverticulum. He points out that the four pathological conditions which take place in Meckel's diverticulum—ulceration, intussusception, acute inflammation and obstruction—are all accompanied by abdominal pain and intestinal hæmorrhage. He claims that it is possible to recognise clinically a chronic, interrupted type of melæna, as well as one with a sudden onset accompanied by abdominal discomfort or colicky pain, as possibly associated with a Meckel's diverticulum. Occasionally there may also be nausea or vomiting. The blood in varying amounts may be mixed with fæces or may be separate. Diagnosis from acute intussusception is possible by a consideration of the facts that in Meckel's diverticulum with ulceration there is no diarrhœa, fæces persist, mucus is absent, and the quantity of blood is likely to be large. In intussusception diarrhœa at first leading to the passage of large quantities of mucus streaked with blood is the rule. Early diagnosis is vital in these cases, for the surgeon must act promptly if tragedy is to be avoided.

INDUSTRIAL PSYCHOLOGY

LIKE most scientific bodies, the National Institute of Industrial Psychology has had to face a series of special problems arising from the war. During 1938 the Institute overcame its financial difficulties, increased its educational work, and, as its chairman said at the annual meeting on Dec. 19, was planning still further extensions in the educational field during 1940. These plans unhappily have had to be suspended. Much of the teaching of the Institute is conducted in collaboration with the University of London; the colleges concerned have removed from London, as have many of the teachers and student teachers who normally attend the Institute's training courses. But the research work, limited though it is owing to lack of funds, is going on. It was to be expected that the demands for the Institute's vocational guidance services would be affected by the war. Anticipation of air-raids at first restrained parents from bringing their children to London, and the evacuation of schools probably also had its effect. But the necessity for a careful consideration of the choice of a career has not been lessened—in many cases it has become more difficult—and expert assistance becomes all the more important. The prospects, and the details concerning training, have been altered in many professions, and it is almost impossible for the average parent to keep himself informed of the changes. It is not surprising, therefore, that the Institute's vocational guidance staff is becoming busy once more. War has brought new problems to industry, with the lighting restrictions, the demand in many industries for large increases of output, and the change-over from peace-time to war-time products. Problems of lighting and ventilation and of selection and training of staff have become particularly pressing. Furthermore, there is some danger that the increase of working-hours may be carried to a stage where the health and efficiency of workers may be so affected that their output actually falls. Here the experience of the Institute, gained from 18½ years of practical work in industry, should be of particular value. The publication of *Occupational Psychology*, the Institute's journal, and of its monthly news-bulletin, is being continued, as is the library service. Thus the Institute looks forward to the future with some confidence, and it may reasonably count on the continued support of its members, despite the difficulties of the times.

ACETATES AND SULPHANILAMIDE

ENGLEHART demonstrated fifty years ago that the animal body protects itself against aniline by acetylating it into the comparatively harmless substance known as antifebrin, and acetylation is now known to be one of the means used by the body of taking the sting out of other poisons, the acetyl group being obtained from acetates, lactates or pyruvates in the body. James[1] has studied in mice the toxicity and therapeutic activity of sulphanilamide when an acetate is given at the same time. Two groups of 10 mice were used, A and B. First 10 mg. of sulphanilamide was given by mouth to each mouse daily for four days, group A receiving the drug alone and group B 10 mg. of sodium acetate daily as well. For the next three days no drugs were given and then group A received sulphanilamide and acetate whilst group B received sulphanilamide alone. After three days' rest all the mice were killed. Analyses of the urine showed that the administration of acetate did increase the amount of the acetyl derivative formed. Next five separate experiments were carried out each with three groups of mice infected with lethal doses of group A hæmolytic streptococcus. One group served as control; the others received five small doses of sulphanilamide, one group with and the other without acetate. The average life of the mice was 2·2 days for the controls, 10·6 days with sulphanilamide alone and 10·4 days with sulphanilamide and acetate. Further experiments with large doses showed that acetate much reduced the acute toxicity of the drug. The spasticity, inco-

1. Dam, H., Tage-Hansen, E., and Plum, P., *Lancet*, 1939, **2**, 1157.
2. Little, H., *Canad. med. Ass. J.* 1939, **41**, 575.

1. James, G. V., *Biochem. J.* 1939, **33**, 1688.

ordination and hyperventilation described by Hoare,[2] which were readily produced by sulphanilamide alone, were either absent or much less if acetate was given as well. Acetate did not seem to be of any value in averting chronic toxic effects. Since sodium acetate produced alkalosis, ammonium acetate was tried instead, with rapidly fatal results, due presumably to the known toxicity of the ammonium ion. Acetylsulphanilamide itself was found to be distinctly more toxic than the free substance, a fact which had been previously observed by Marshall and others.[3] This disturbing fact shows that the protective action of acetates, although apparently due to acetylation of the base in the body, is not as simple as might be supposed.

CHORIONEPITHELIOMA

THE use of tests for gonadotropic hormones in the urine of patients suffering from chorionepithelioma has introduced another element in the diagnosis and prognosis of this rare and variable disease. Wilson[4] of the University of Rochester, and Brews of the London Hospital in his Blair Bell memorial lecture have both lately described its clinical and pathological Brews[5] on 26. The main feature of the clinical features. Wilson based his remarks on 5 cases and picture is the history of hydatidiform mole, abortion or pregnancy closely preceding the vaginal bleeding. In Wilson's series 2 cases followed moles, 2 abortion and 1 normal labour. Brews says that 8 of his cases followed moles, 7 abortion and 4 labour. The mortality is high: 2 of Wilson's 5 patients are alive, but both are recent cases; and only 9 of Brews's patients survived five years. Metastases are common and liable to retrogress on the removal of the primary growth, and ectopic tumours are found from time to time with no apparent focus in the genital tract. Thus Wilson reports 1 case and Brews 7 with metastases in the vagina. The later cases in both series were investigated both before and after operation by repeated hormonic tests, and they showed a rapid fall in hormones in the urine after removal of the growth. The value of these tests in diagnosis and prognosis seems to be substantiated, but Wilson points out that a negative test may not necessarily exclude chorionepithelioma in spite of Aschheim's statement to the contrary. In his first case the Friedman test was negative on two occasions and was only positive when the patient was dying from secondaries. This same case also illustrated the difficulty which may be experienced in getting proof by the curette if the tumour is infiltrating the deeper muscle of the uterus out of reach of the instrument; normal curettings may then be obtained repeatedly. The differentiation from microscopical appearances between hydatidiform mole and chorionepithelioma may be extremely difficult. Wilson considers the division of moles into benign and malignant varieties to be wrong and thus differs from Ewing,[6] but most authorities agree that frequent areas of necrosis of muscle round masses of infiltrating trophoblast are evidence of malignancy. After the removal of either a mole or a chorionepithelioma repeated hormone tests should be carried out. A positive Friedman test persisting after operation will suggest that the removal has been incomplete or that metastases have formed. It should be noted, however, that with a complete removal the ordinary qualitative test may take several months to become negative, whereas the quantitative test becomes negative almost immediately. The appearance of a positive reaction after it has been negative will suggest recurrence.

2. Hoare, E. D., *Lancet*, 1939, **1**, 76.
3. *Science*, 1937, **85**, 202; *J. Amer. med. Ass.* 1938, **110**, 252.
4. Wilson, K. M., *Amer. J. Obstet. Gynec.* 1939, **38**, 824.
5. Brews, A., see *Lancet*, 1939, **1**, 283.
6. Ewing, J., Neoplastic Diseases, 1928, 3rd. ed.

LITHIASIS AND NIGHT-BLINDNESS

SINCE renal calculi can be produced in animals by feeding them on a diet deficient in vitamin A and the same deficiency is a common cause of night-blindness, Ezickson and Feldman[1] studied 25 adults with calculi or a recent history of calculi and found that 24 of them had "pathological" dark-adaptation. A more extensive investigation has now been made by Canova[2] on bedouin of the Arabian desert south of the Dead Sea, where the incidence of lithiasis, especially urinary calculi, is abnormally high. The usual causal factors advanced to explain this heavy incidence—excess of meat in the diet, abuse of tea, and widespread filariasis and bilharziasis (the ova in the bladder forming nuclei for calculi)—can be disregarded in this region. The diet of these bedouin consists mainly of carbohydrates, chiefly polished rice and a little bread and lentils. Green vegetables and fruit are unobtainable for many months of the year. Flesh and milk are not absolutely lacking but cannot contain much vitamin A, because they are derived from the camel and the *kharuf* (a local breed of sheep), whose only fodder is dry grass and twigs. In a year Canova examined 126 cases. Of 48 with a history of spontaneous passage of a urinary calculus 16 showed deficient dark-adaptation; of 22 with a recent history of operation for renal or for vesical calculus 6 showed deficiency; and of 56 with lithiasis 37 showed deficiency: a total of 59 out of 126. Canova next examined for evidence of lithiasis 36 patients attending hospital because of night-blindness and found that 8 of them had calculi. If these 8 cases are added to his series of 126, there is a deficiency of vitamin A in exactly half the cases of lithiasis, and lithiasis in 67 out of 95 cases of night-blindness. For a region where both conditions are so common these figures do not prove a causal connexion; nor is the incidence of lithiasis explained, which according to Canova falls more on the men than on the women and more on the young than on the elderly. Further, it must be remembered that one of the factors that favours deposition of calcium is diminished secretion in hot weather.[3] It would be interesting to compare the incidence of lithiasis in a similar climate elsewhere.

1. Ezickson, W. J. and Feldman, J., B., *J. Amer. med. Ass.* 1937, **109**, 1706, cited in *Lancet*, 1938, **1**, 33.
2. Canova, F. *Minerva med. Torino*, Nov. 17, 1939, p. 451.
3. *Lancet*, 1938, **1**, 33.
4. *J. R. stat. Soc.* 1939, part 4, 565.

STATISTICS OF FLOGGING

THE retention of corporal punishment can clearly be justified only if it can be shown that sentence of imprisonment is in itself insufficient to act as a deterrent to would-be committers of crime and that the addition of flogging has substantially more effect. From an examination of the published records of the volume of crime of robbery with violence, and of the number of people sentenced to be flogged for this crime, during the period 1863 to 1936, Mr. E. Lewis-Faning, Ph.D., of the Medical Research Council's statistical staff, is unable to find that it has that effect.[4] The time-sequence of the two curves suggests, in fact, no relation at all between the number of floggings and the amount of crime in the same year, the previous year or the subsequent year. From 1894 to 1910, for instance, the proportion of floggings fell steadily but the number of crimes fell also; in the last twenty years of the series the incidence of crime followed a fairly even path while floggings fluctuated

wildly. These latter figures are interesting. In the 1860's the number of crimes of robbery with violence known to the police was some 700 per annum, or about 130 per million males aged 15–54; in 1930–36 the corresponding figures were some 200 per annum or 15–20 per million. On the other hand the number of floggings only twice exceeded 20 per cent. up to the time of the last war, but since 1921 has rarely fallen below this level. As robbery with violence has decreased has it become more detestable to the modern outlook and therefore been treated with more severity? Retribution is certainly not in accord with modern theories of penal treatment. Or is it that as the total number of crimes has diminished a larger proportion of the residue are of a particularly brutal nature, calling apparently for greater severity? This study supports the view that such severity certainly does not influence the curve of crime.

A LITTLE-KNOWN TYPE OF POLYNEURITIS

In the *Schweizerische Medizinische Wochenschrift* for Dec. 2 Dr. Anita Saurer has recorded the clinical findings in a patient whose illness belongs to a small but important group of cases of polyneuritis. The cardinal features of this group are the widespread and severe, often totally quadruplegic, nature of the motor symptoms, the absence of any but slight and fugitive sensory symptoms, the rapid onset, and the almost invariably favourable prognosis though improvement is slow. The facial nerves are sometimes involved, with bilateral facial palsy, but the other cranial nerves do not suffer. The cerebrospinal fluid shows a highly characteristic picture of much increased protein with no increase of cells. In those cases which have come to post-mortem examination—death being due to respiratory failure in an early stage—the histological lesions are found to be restricted to the peripheral nerves and to be maximal at their central ends; the grey matter of the spinal cord shows no involvement. Isolated cases of this remarkable clinical picture were noted as early as 1880, but the first group of such patients was described by Gordon Holmes in 1917. Since the special characters of the pathological state were first fully recognised by Guillain and Barré, who published an account of two cases in October 1916, the condition is commonly referred to in connexion with their names. When, as in Gordon Holmes's cases, the changes are found under epidemic conditions, there is good reason to suspect that an infective agent is responsible. This view has been adopted by more recent observers, who refer to a specific neurotropic virus, but they are unable to produce any experimental evidence to substantiate it. Were it not for the unequivocal histological evidence of the complete integrity of the grey matter of the cord, it would clearly be reasonable to regard these as cases of anterior poliomyelitis, not of "acute epidemic" form but due to a neurotropic virus with similar affinities for certain motor cells. The comparatively acute onset of widespread flaccid paralysis with loss of all tendon reflexes and the absence of sensory changes speak strongly for this view. However, the differentiation between polyradiculoneuritis of this type and anterior poliomyelitis does not rest upon the post-mortem evidence alone. The absence of any period of general febrile reaction in most cases of the former, the rapidly progressive, but not sudden, onset of paralysis, the diffuse bilaterally symmetrical distribution of the paralysis as opposed to a segmental distribution, the peculiar liability of the facial rather than the bulbar nuclei to be damaged, and the great difference in the prognosis, are all equally distinctive. With this last difference must be associated two related findings which are remarkable in view of the prolonged complete flaccid paralysis often lasting for many months—the minimal change in the electrical reactions and the absence of any severe muscular wasting. The first group of these cases was described in epidemic form during the last war. It may be particularly important that Dr. Saurer should have drawn attention to this little recognised clinical picture now, when the revival of some unknown ætiological factors associated with war may lead to its reappearance in epidemic form.

THE DENTAL BOARD IN WAR-TIME

The first act of the Dental Board's new chairman, Mr. Edward Leo Sheridan, L.D.S., F.R.C.S.I., in opening the 37th session, was to honour the memory of his lay predecessor, Sir Francis Acland, who had occupied the chair from the start. Having done this he enjoined his colleagues to look forward with what equanimity they could command to living for the period of what is mildly called the present emergency on not more than half their normal income. The annual retention fee of £4 had been reconsidered; it was to be remitted to any dentist serving in the armed forces or engaged in other important national service, and for the remainder the normal fee was to be halved and no more than £1 to be solicited for the first two years after registration. "War," Mr. Sheridan recalled, "is a choice of evils, not an opportunity for departmental perfection," and while discharging such primary duties as the maintenance of the register, the board finds itself much restricted in the spending of professional money on improving the structure and equipment of the schools, on helping students to qualify, and on dental research and health education. Another war-time economy was to reduce to very small proportions the time spent on dealing with matters of discipline.

CLINICAL FACTORS IN TYPHOID FEVER

In his analytical study of 444 cases of typhoid fever admitted to three units of the Madras General Hospital during 1936–38 Professor Minchin [1] attempts to evaluate the different diets prescribed in the three units and comments on the frequency and significance of certain symptoms. The diets given were (*a*) a low diet with added vitamins; (*b*) a lower diet, almost the classical starvation diet; (*c*) a high diet approximating to Coleman's [2] high calorific diet. As is usual in clinical investigations of this type, the groups were not strictly comparable. Estimation of the value of diet alone was complicated by the use in the third unit of castor oil for constipation, on the hypothesis that a bowel in a state of mild peristalsis would be freer of toxic intestinal contents and therefore less liable to complications. Although the four perforations, all fatal, occurred in patients on a starvation diet, and the percentage of all bowel complication was least with the high diet, there was no significant difference in the case-fatality rates (average 13·7). Minchin argues from this that the administration of purgatives in moderate doses produces no adverse effects, provides relief to the patient, and reduces the liability to bowel complications such as tympanites, hæmorrhage and perforation. On the figures he quotes these inferences are not justified.

Clinicians with experience of enteric fever know that attention is often directed to the respiratory rather than the alimentary tract, but even to them Minchin's figures will be surprising. Diarrhœa or

1. Minchin, R. L. H., *Indian med. Gaz.* 1939, **74**, 591.
2. Coleman, W., *Amer. med. Ass.* 1917, **69**, 329.

constipation was a primary symptom in only 7 per cent. of cases, whereas nearly a quarter complained of cough and 11·8 per cent. of all cases developed bronchopneumonia, 40 per cent. of them dying. Minchin goes so far as to recommend that, in tropical countries, all bronchopneumonias should be investigated as possible cases of typhoid fever. In this series none of the patients had epistaxis, rose spots were difficult to see on the Indian skin, and enlargement of the spleen was rare. Where malaria and kala-azar are rampant, splenomegaly is of little diagnostic value. The prognostic significance of initial symptoms was equivocal, with the exception of diarrhœa, which was associated with a fatality-rate twice the average. When this symptom developed in hospital the prognosis was bad, 40 per cent. dying. No support was forthcoming for the view of Lantin[3] that a positive blood-culture indicates a worse prognosis. The diagnostic value of blood-culture in every case of typhoid fever, no matter how late, was emphasised by the finding of positive results in 11 per cent. of cases after the fifteenth day of the disease. A review such as this is of particular value in war, when a lowering of the standards of the disposal of excreta and of the preparation of food and drink may result in an increased prevalence of ingestive diseases.

A NEW DRUG FOR STAPHYLOCOCCAL INFECTIONS.

WE have lately commented in these columns[4] on the good results being reported from the treatment of generalised staphylococcal infection with sulphapyridine, but inevitably the search goes on for more effective and less toxic sulphonamide compounds. A preparation in which a thiazol radical replaced one of the amido groups in sulphanilamide was found to be effective against certain experimental coccal infections, and now Herrell and Brown[5] present a preliminary report on the use of a methylated derivative of this compound, "sulphamethylthiazol," in staphylococcal infections. Both in the test-tube and in experimentally infected mice this drug gave better results than either sulphanilamide or sulphapyridine, and was apparently non-toxic to normal human subjects. An opportunity arose to test it therapeutically in a woman who developed staphylococcal septicæmia after a gall-bladder operation. This patient had been treated earlier with sulphapyridine which caused severe nausea and vomiting, and she refused to take it again. She was therefore given 2 g. of sulphamethylthiazol, followed by another 2 g. four hours later and after that 1 g. four-hourly for the next six days. Within twenty-four hours the patient was much improved, and the temperature gradually fell to normal four days after treatment was begun. There were no toxic effects apart from a mild erythematous rash. Meanwhile older remedies are not without their protagonists. Baker and Shands[6] give a useful review of the results obtained in acute osteomyelitis with staphylococcus antitoxin, and report their own findings in a series of 65 such cases with positive blood-culture. Of 30 cases which did not receive antitoxin 70 per cent. died compared with a fatality-rate of 25·7 per cent. among 35 treated patients. If the degree of bacteræmia is a justifiable criterion, there was a higher proportion of severely ill patients among the treated than among the untreated cases. Baker and Shand recommend big doses—40,000 to 60,000 units—of antitoxin intravenously, the total amount to depend on the Schilling count of the polymorphonuclear cells or the antitoxin content of the patient's blood. Staphylococcus toxoid may be given during the recovery stage. Immediate and adequate surgical drainage was carried out on all cases. It is evident that encouraging results may be obtained either with drug alone or with antitoxin alone, but so far no-one has recorded a series of cases treated with both drug and antitoxin. It will be interesting to see what this combination can do in a type of infection where in the past the betting has been on the staphylococcus.

3. Lantin, P. T., *Amer. J. med. Sci.* 1933, **185**, 768.
4. *Lancet*, 1939, **2**, 1076.
5. *Proc. Mayo Clin.* 1939, **14**, 753.
6. *J. Amer. med. Ass.* 1939, **113**, 2119.

SCIENCE AND CANNING

IN an article on research in canning in the trade supplement of the *Times* for January, Mr. F. Hirst, director of the University of Bristol fruit and vegetable preservation research station, points out that the preservation of canned foods has now been placed on a satisfactory basis, because the fundamental principles of "processing" (the technical term for the heat treatment given) have both been established and put into practice. On the technical side stationary retorts with controls liable to human fallibilities are being replaced by pressure cookers worked automatically, and these are now available not only for fruit but for non-acid products, such as vegetables, meat and fish, which require much higher temperatures. Tin poisoning from canned foods is not a health hazard, but the action of the acid contents on the tin container is a commercial problem, for the interaction of acid and tin gives rise to the production of hydrogen which bulges the tin and is responsible for one variety of "blown" tin. Such tins in the trade are known as "hydrogen swells," and while the contents are harmless the tin is unsaleable. This problem is being dealt with mainly along two lines. One is by a study of the composition of the steel base and the preparation of a plate less susceptible to corrosion. The other is by looking for a feasible way of reducing or eliminating contact between the container and its contents. Early investigations with lacquer-coated containers were not altogether satisfactory, but more recently the lacquer coating has been applied after the can has been made up, and in this way the trouble can largely be eliminated and the tin dissolved is reduced to negligible amounts. Research has also played an important part in improving the quality of the foods canned. Particularly as regards fruit and vegetables the strains used for canning, the exact age when canned and the type of preliminary treatment are all of importance in giving a satisfactory product. The application of scientific study to food preparation is a feature of modern life, and although this has not always been to the benefit of the consumer the canning industry and its customers have undoubtedly gained from the association.

Sir ARTHUR MACNALTY'S report on the health of the school-child appears this week (H.M. Stationery Office, 1*s.* 3*d.*). Economy has dictated some curtailment of the usual chapters on special subjects, but it is satisfactory to learn that the average heights and weights of school-children throughout the country are being maintained, and that the standard of nutrition has remained constant for the last three years, although minor degrees of defect are now being more faithfully reported. This report deals with the year 1938 when the school medical service was already distracted by rumours of war, and arrangements for evacuation threw an unprecedented strain on the service. The partial rehearsal of the September crisis proved the value of the scheme as a whole.

SPECIAL ARTICLES

BLOOD-PRESSURE AND ITS ESTIMATION *

BY CRIGHTON BRAMWELL, M.A. Camb., M.D. Manc., F.R.C.P.
PHYSICIAN TO THE MANCHESTER ROYAL INFIRMARY

COMMITTEES were appointed last year by the Cardiac Society of Great Britain and Ireland and by the American Heart Association to draw up recommendations for standardising the methods of estimating blood-pressure (*Brit. Heart J.* 1939).

CERTAIN FALLACIES

If reliable blood-pressure readings are to be obtained, care must be taken to exclude certain fallacies. I need not here refer to obvious mechanical defects in the sphygmomanometer nor to the necessity, when an aneroid instrument is used, of calibrating it frequently against a mercurial manometer. One important point which is apt to be overlooked is the condition of the patient when the reading is taken. To ascertain the basal blood-pressure, by eliminating all extraneous influences likely to affect it, entails precautions similar to those used in estimating the basal metabolism. The blood-pressure is lowest in the morning and tends to rise during the day; it is affected by exercise, by variations in heart-rate, and a temporary rise takes place after meals; it is profoundly affected by nervous stimuli. With the object of eliminating so far as possible the effect of these extraneous factors, the patient should rest quietly for 10–15 min. before the reading is made. The blood-pressure should not be taken immediately after a meal. The sitting position was recommended by the American committee, but careful observations by members of the British committee did not show any significant difference between the readings obtained in the sitting and lying positions. Every effort should be made to allay the patient's nervous apprehension, and more than one reading must be taken, for the first compression of the arm is liable to induce a reflex arterial spasm, which results in an abnormally high reading. Having observed all these precautions, one must still bear in mind the likelihood of abnormally high readings in persons of a nervous temperament. So important is the emotional factor in producing a temporary rise of the systolic pressure that it has become the practice of the Royal Air Force medical board almost to disregard the systolic reading in young candidates, provided that the diastolic pressure is below 80 and the cardiovascular efficiency satisfactory (Treadgold 1933).

The second potent source of error in the estimation of blood-pressure is the misinterpretation of the sounds heard on auscultation. Erroneous auscultatory readings of the systolic pressure can be avoided by comparison with the reading obtained by palpation. The former is usually a few millimetres higher than the latter. This check also provides a safeguard against error in those cases where there is a "silent gap" in the sequence of sounds heard during decompression.

There is a second reason for taking a preliminary rough reading by palpation—namely, the comfort of the patient. Compression of the arm is never pleasant, and prolonged compression, leading to venous congestion, may be extremely uncomfortable, especially to a sensitive patient. If the first systolic reading be taken by palpation, it is unnecessary to overshoot the mark by more than a few millimetres, whereas, if it is taken by auscultation, the pressure has to be raised to an unnecessarily high level, to avoid the risk of missing the systolic end-point during decompression. In taking this preliminary rough systolic reading, my practice is to raise the pressure quickly, in steps of 10 mm., until the radial pulse disappears.

Errors in the determination of the diastolic pressure are extremely common. One reason for this is the divergence of opinion regarding the diastolic end-point. Many American insurance companies instruct their examiners to regard the disappearance of the arterial sounds as the diastolic end-point. The American blood-pressure committee sanctioned this practice. This was, in fact, the only important point on which the two committees disagreed, our committee insisting, I believe rightly, that the true diastolic end-point is marked not by the disappearance of the

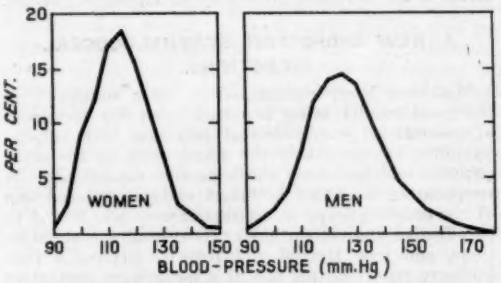


FIG. 1—Systolic blood-pressures of 5807 women and 2930 men students aged 16–40. (After Alvarez 1920.)

sounds but by the transition from the loud sharp sounds of the third phase to the faint muffled sounds of the fourth phase. The difference between these two readings is generally small, for the transition from third-phase to fourth-phase sounds is usually only a few millimetres above the point at which the sounds finally die away; but, in patients with aortic regurgitation, the fourth phase may be greatly prolonged. Admittedly the transition from third to fourth phase is not always clearly defined, but our committee believed that in such cases an accurate diastolic reading could not be obtained.

As I shall show later, the sharp character of the third-phase Korotkow sounds is due to the development of certain changes in the form of the pulse wave produced by the pressure of the armlet. In aortic stenosis and in some other conditions in which the pulse is of the slow-rising anacrotic type these changes do not take place; consequently, in these cases, no sharp sounds are heard, and the diastolic pressure cannot be estimated clinically. Again, in patients with an irregular pulse, the beats vary in strength, and there is a corresponding variation in both systolic and diastolic pressures. In all such conditions the readings obtained are only approximate.

Lastly, it is important to remember that the clinical methods which we employ for measuring blood-pressure are essentially rough methods; they entail a considerable margin of experimental error. In France, it is customary to express the pressure not in

* The George Alexander Gibson lecture delivered at the Royal College of Physicians of Edinburgh on Oct. 24, 1939.

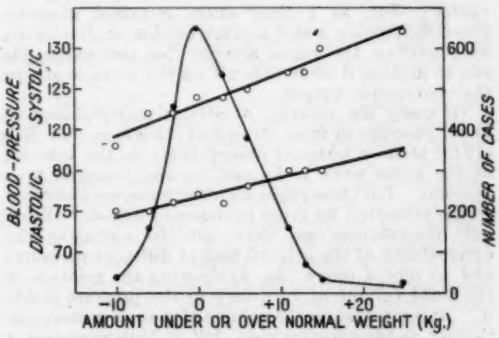


FIG. 2—Systolic and diastolic blood-pressures of 2497 fit pilots, showing effect of body-build.

millimetres but in centimetres. My practice has always been that recommended by both blood-pressure committees—namely, to read systolic and diastolic pressures to the nearest 5 mm. Thus a pressure of 152/84 is expressed as 150/85. I believe that to attempt to obtain greater accuracy is both scientifically unsound and clinically unnecessary, though one of my predecessors in this lectureship assures me that he once received an insurance report in which the examiner stated that the systolic blood-pressure was 128·3!

WHAT IS NORMAL BLOOD-PRESSURE?

When my students ask me what is the normal blood-pressure for a man aged 30, my reply is "What is the normal height of a man aged 30?" Blood-pressure varies just as much as height, and it is essential to know not only the average normal value but also the range of normal variation. We are accustomed to speak of 120 mm. Hg as the normal systolic pressure for a young man; but if you examine many healthy young men you will find some with a pressure of 130, 140 or even higher. Personally, I do not consider any reading under 150 mm. Hg in an adult as necessarily abnormal. In his series of university students, comprising 5807 women and 2930 men, aged 16–40, Alvarez (1920) found that the mean systolic pressure was 126·5 in the men and 115 in the women (fig. 1).

TABLE I—EFFECTS OF AGE ON BLOOD-PRESSURE IN 2497 FIT PILOTS IN 1932 (TREADGOLD 1933)

Age-groups. . .	19 and 20	21–25	26–30	31–35	36–39	Total
Number examined .	102	1140	569	406	280	2497
Systolic pressure .	122	124	124	124	125	124
Diastolic ,, .	75	76	77	78	79	77

It is commonly stated that the blood-pressure rises progressively with age. That is true only in a general sense. Some interesting observations on this subject were made by Treadgold (1933) at the central medical establishment of the Royal Air Force. His paper includes a detailed analysis of the blood-pressure readings in 2497 fit pilots of the Royal Air Force. He found that in these men there was little change in the systolic pressure between the ages of 18 and 40. Table I shows that in the three age-groups from 21 to 35 the average systolic pressure was the same.

Treadgold also showed that in men of normal body build the blood-pressure did not vary with height or weight. In the overweight and underweight groups, on the other hand, both systolic and diastolic pressures varied with the weight, the average figures obtained being 118/75 in the lightest and 132/82 in the heaviest group. Fig. 2 is a graphic representation of the values given by Treadgold. The abscissæ represent weight in kg. below or above the mean value and the ordinates blood-pressure. The curve shows the numerical distribution by weight of the whole 2497 cases. Let me repeat that blood-pressure does not vary with weight, provided that the individual is of normal body build; it is only when the weight is disproportionate to the height that the blood-pressure deviates from the average normal figure. The same applies to the individual; when he puts on weight and so alters his body build, his blood-pressure tends to go up, and vice versa. Fig. 3 represents readings obtained by Treadgold (1933) in the same pilot at the routine examination in four successive years.

Even in perfectly healthy people the arteries tend to lose their elasticity with advancing years; they become less extensible, and consequently an increased pulse pressure is necessary to enable the heart to maintain its output. This is clearly seen in old age. Thompson and Todd (1922) studied 102 healthy old men (Chelsea pensioners) aged 75–92. The mode in this series was 150/80. The systolic reading is not so high as one might expect, but the pulse pressure is raised. Thompson and Todd found that these old men were extremely susceptible to a rise in blood-pressure from emotional causes. One is accustomed to think of arteriosclerosis as a disease of old age; but, as a matter of fact, the arteries begin to lose their elasticity early in life. Hill and McSwiney and I (1923) made some observations on this point in a series of 74 normal subjects. We found that the arterial extensibility, as calculated from direct observations on the velocity of the pulse wave, diminished progressively from 0·47 at the age of 5 to 0·17 at the age of 80 (table II). The arterial extensibility in this calculation is expressed in terms of the percentage increase in volume per mm. increase of pressure.

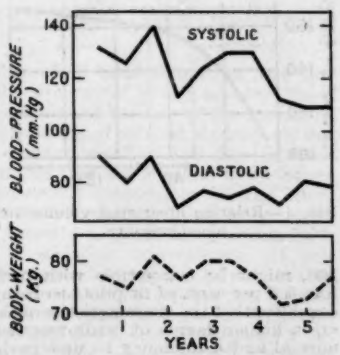


FIG. 3—Relation of blood-pressure to varying body-weight. (After Treadgold 1933.)

TABLE II—VELOCITY OF PULSE WAVE AND ARTERIAL ELASTICITY IN 74 HEALTHY SUBJECTS

Age . .	5	10	15	20	30	40	50	60	70	80
Mean velocity*	5·2	5·55	5·9	6·2	6·75	7·2	7·6	8·0	8·3	8·55
Mean elasticity	0·47	0·41	0·36	0·33	0·28	0·24	0·22	0·20	0·18	0·17

* Metres per sec.

For insurance purposes it is important to know the average normal blood-pressure at different ages, for the expectation of life is greatly reduced in subjects

with a persistently raised pressure. Thus Hilton (1936) states that a rise of 30 mm. of mercury above the average systolic value about doubles the ratio of actual to expected deaths, and a rise of 50 mm. above the average increases this ratio to four times. He says that a third of these premature deaths are due to cardiac failure in one form or another.

The average normal values for the systolic pressure given by the actuarial statistics of three of the large insurance companies whose figures I have consulted are in fairly close agreement. According to one company they rise from 123 mm. Hg at 20 years of age to 131 mm. Hg at 50. The corresponding figures given by another company are 125 and 135. These insurance statistics indicate that, in the general population, the average systolic pressure varies with age instead of remaining practically constant, as Treadgold (1933) found between the ages of 21 and 40; but this discrepancy may be due to the fact that Treadgold was dealing with men of exceptionally fine physique, and he states that even among fit pilots of the Royal Air Force examined at the annual medical examinations 1927–31 there were 6 per cent. yearly with systolic pressures of 140 and over.

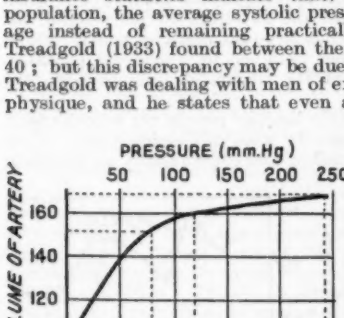


FIG. 4—Relation of arterial volume to blood-pressure.

At the other extreme, Treadgold found that hypotension, even when the systolic pressure was below 100, might be compatible with perfect health. He found 3 per cent. of fit pilots to be hypotensive. He considers that the characteristics of the fit hypotensive are a higher degree of cardiovascular efficiency than normal and a tendency to underweight.

Ellis and I (1931) reached the same conclusion as the result of our investigation of athletes at the Olympic games in Amsterdam in 1928. Four of the 28 Marathon runners examined during the course of their training had a diastolic pressure below 70, and one man, whose systolic pressure was 105 and diastolic pressure 70, came in third in the race.

The problem of hypotension is considered in greater detail by Rook and Dawson (1938), who regard systolic pressures between 110 and 100 or diastolic pressures between 70 and 60 as indicating moderate hypotension, and systolic pressures below 100 or diastolic below 60 as severe hypotension. They point out that hypotension may be either occasional or persistent, and that, although persistent hypotension is relatively rare and is usually secondary to some general disease, it may be compatible with perfect health.

Effect of blood-pressure on arterial extensibility.—A question that I am often asked is "What is the clinical significance of the systolic and diastolic readings?" My answer is that the systolic is a measure of the pumping capacity of the left ventricle, whereas the diastolic indicates the resistance against which it has to work. Expressed in terms of commerce, these two readings represent the assets and the liabilities of the heart. Just as a falling income and a rising expenditure are bound in time to lead to bankruptcy, so a falling systolic pressure and a rising diastolic indicate that failure of the circulation cannot be long postponed. It is obvious that the higher the diastolic pressure, the more work the left ventricle has to perform in forcing open the aortic valves; but, as I shall show, a raised diastolic pressure imposes a still further burden on the heart, by rendering the whole arterial tree less extensible and so making it more difficult for the aorta to accept the ventricular output.

To study the relation of arterial extensibility to blood-pressure in man, Bramwell, Downing and Hill (1923) made a series of observations on the velocity of the pulse wave in human arteries removed post mortem. For these experiments arteries were selected which presented no gross evidence of disease. From our observations we were able to calculate the extensibility of the arterial wall at different pressures and to plot a curve (fig. 4) showing the relation of the total volume of an artery to the pressure inside it. At low pressures the volume of the artery increases rapidly as the pressure rises, but at high pressures it increases much more slowly.

Let us now turn to the clinical application of these facts. Fig. 4 shows that, when the diastolic pressure is 80, a systolic pressure of 120—i.e., a pulse pressure of 40—produces an increase in volume of the artery of about 8 per cent. When, however, the diastolic pressure is 120, the arterial wall is already under considerable tension at the end of the diastole; it has become much less extensible, and a pulse pressure of about 120—i.e., thrice as high—is required to produce a similar increase in volume. When the diastolic pressure is very high, even an enormous pulse pressure will enable the arteries to accept only a relatively small ventricular output. Then, apart from the danger of rupturing diseased arteries by a very high systolic pressure or of imposing an intolerable burden on the heart, the mere limitation of the cardiac output is alone sufficient to make severe physical effort impossible.

(*To be concluded*)

EMERGENCY HOSPITAL ORGANISATION

RECENT DEVELOPMENTS

AT the beginning of the war some 190,000 hospital beds were made available for casualties in England and Wales. This figure included the normal vacant beds; the beds that had been cleared at the beginning of the war, on the Ministry's instructions that patients not in urgent need of inpatient treatment should be discharged; and the additional beds which had been supplied by the Ministry and set up in the hospitals. At the present moment there are about 145,000 vacant beds immediately available for casualties. This drop, in spite of the additional beds distributed and equipped by the Ministry and the completion of a number of hut schemes, is explained by the fact that, owing to the course taken by the war, the Ministry encouraged hospitals to admit all people requiring inpatient treatment, with the result that there has been a considerable reflux of ordinary civilian sick; this reflux will presumably continue during the winter months of January and February. In addition, a considerable number of institutions have been released for the time being from any obligation to make beds available under the scheme. Out of about 2500 hospitals and other institutions within the scheme, approximately 1000—nearly all of them small and relatively unimportant—have been released in this way and their vacant beds (about 20,000) are no longer taken into account in estimating the accommodation set aside for casualties. If there were serious air-raids it would be possible substantially to increase the present number of vacant beds by clearing hospitals as at the beginning of the

war, though it would probably be difficult to make as complete and effective a clearance again, and by bringing back within the scheme some or all of the hospitals and institutions which have been temporarily released.

In the meantime the scheme for building hutted annexes is continuing. It is estimated that nearly a third of the 100 schemes should be completed by the end of January and most of the rest roofed in by then, so that they would provide shelter in an acute emergency. Almost all of the schemes should have been finished by the end of March. When the schemes are all finished they will provide some 36,000 beds which did not exist before the war, and will thus serve to counterbalance the inroad upon accommodation which is being made by the ordinary civilian sick. There will in any case always be a substantial balance of beds ready to meet any initial shock.

REVISED ARRANGEMENTS

The course of the war has made it possible to introduce modifications into the London sector scheme, though these will not diminish the total number of beds ready for air-raid casualties. Hitherto the inner hospitals within the sectors have kept a specified number of beds empty for casualties, and have admitted only a limited number of ordinary patients. On Oct. 25 a letter was sent to the inner voluntary hospitals authorising them to encroach upon 20 per cent. of the casualty beds, in order to provide for ordinary patients. Any civilian sick in excess of the agreed number who were transferred to the outer hospitals in the sectors became the financial liability of the Government. More recently it has been decided further to modify the present arrangements, and on Dec. 21 a letter was sent to the inner voluntary hospitals in London stating that the Minister proposed to revise the arrangements on the following lines:—

(1) The number of beds reserved for casualties will be reduced by a fifth, and the beds thus released will become available for the ordinary sick.

(2) In addition, hospitals may open as many of the beds at present closed as will bring the total casualty and sick beds up to approximately two-thirds of the normal accommodation of the hospitals (at any hospital where a greater proportion is already in use no reduction is proposed).

(3) The remainder of the beds, amounting to approximately a third of the total, will at present remain closed.

These proportions are only intended as a general guide, and it is left to the different hospital authorities to decide in consultation with the group officer and hospital officer for London what actual numbers should be adopted. It is intended to review the scheme again after three months, or before then if it seems desirable.

The new arrangements will, it is hoped, come into operation some time this month, and should make some 1500–2000 additional beds available for the ordinary civilian sick in the inner voluntary hospitals in London. This will mean an important increase in the London hospital facilities (which have already been improved by releasing a number of the smaller hospitals), and will make it less often necessary to decant patients to the outer hospitals, without affecting the total number of beds available. The sector scheme is however being kept in operation. The outer hospitals will continue to be used for casualties and for any overflow of civilian sick from the inner hospitals.

Since under the revised arrangements fewer ordinary civilian sick will be transferred to the outer hospitals, some rearrangements of equipment and personnel will be necessary, and group officers have been asked to go into this. A good deal of expensive equipment which may need replacing—e.g., X-ray equipment—was loaned by inner to outer hospitals at the beginning of the war, and some of this will have to be returned to enable the inner hospitals to treat increased numbers of ordinary patients. It is being left to group officers to work out the precise redistribution of equipment which is necessary. With regard to personnel, the introduction of the revised arrangements has been made much easier by the success of the invitation to specialists and consultants to accept new conditions of service. Of the 760 specialists (the great majority in the London sectors) who were offered the new conditions, 466, a little over 60 per cent., have accepted. Subject to the first call of the Emergency Medical Service these practitioners are now free to engage in their normal work, and since most of them are on the visiting staffs of hospitals there should now be no difficulty in ensuring a sufficiency of consultants for ordinary civilian patients in the inner London hospitals.

BILLETING OF MEDICAL STUDENTS

In a letter addressed to local authorities and hospitals on Jan. 9, the Ministry of Health says that there appears to be some misunderstanding of the intentions with regard to the billeting of medical students set out in the Ministry's circular issued on Dec. 29. In those circulars, it was stated that the Minister is no longer prepared to be financially responsible for the board and lodging of medical students, unless the pressure of casualty work becomes so great that students have to be employed in assisting in treatment. It was added that the Minister is prepared to secure that students should continue to be billeted on private householders, or accommodated in the outer hospitals, where they are attached for teaching purposes to an institution other than their normal teaching hospital and consequently cannot live in their usual place of residence.

The two questions on which inquiries have arisen are: (1) how much the students are expected to pay, and (2) who is to be responsible for collecting payment from them. It is clear that where a student is billeted on a private householder under the ordinary one guinea a week arrangement, all he is expected to pay is the guinea. Where a student is accommodated in a hospital, whether voluntary or municipal, some difficulty has occurred because some hospitals had, before the war, an arrangement by which students so accommodated paid more than a guinea a week for their board and lodging. It does not seem possible in existing circumstances to ask students to pay more because they happen to be in hospital than they would have to pay in private billets, and accordingly the Minister considers that the students can only be asked to repay one guinea a week.

As regards collection of payment it is considered that the most convenient arrangement will be for the teaching hospitals to recover the weekly guineas from their students and to include the amounts so collected as a credit to the Ministry in the appropriate spaces which will be provided in the form of account now in process of being settled between the Ministry and the voluntary hospitals. Where the students are in private billets the amount will thus be applied to repay the cost of billeting borne by the Government. Where the students are accommodated by outer hospitals, the department will allocate the amount collected from

such students to the various hospitals concerned and credit them accordingly.

It is not intended that the arrangements for billeting students should apply to any of the inner hospitals. So far as these are concerned, students can presumably live in exactly the same way as they live in peace-time when they are attached to a teaching hospital, and the Minister is not prepared to recognise any responsibility in regard to their board and lodging, so long as the pressure of casualty work is not great enough to make it essential to employ them in attending to patients.

UNITED STATES OF AMERICA.

(FROM OUR OWN CORRESPONDENT)

PUERPERAL FATALITY

In a paper presented to the American Statistical Association in the last week of 1939 there was coined a new rate, to wit a "puerperal fatality-rate." This is calculated on a population exposed to the risk of giving birth to viable offspring and includes mothers who were delivered either of living or of stillborn infants. It was not possible to base a rate on a population including all pregnant women, since no certificate is filed for non-fatal abortions, miscarriages or ectopic pregnancies, and when women die undelivered no birth-certificate is filed. Yerushalmy, Kramer and Gardiner obtained their rates by matching death certificates of mothers with the corresponding birth certificates and so obtained on single punch cards the data from both birth and death certificates relating to 255,727 deliveries and 689 maternal deaths. The latter figure represents 61·4 per cent. of all the maternal deaths recorded in upstate New York in the period 1936–38. Of the 433 deaths that could not be associated with a birth certificate it was possible to establish with reasonable certainty that 244 were associated with abortion or miscarriage, 74 with ectopic pregnancies and that 93 mothers had died undelivered.

Considering only the 689 deaths the authors derive a puerperal fatality-rate of 26·9 per 10,000 confinements. The rate was 19·2 when the infant was born alive and 301·6 when the infant was born dead. It was 16·2 for mothers whose infants survived the first month of life and 108·7 for mothers whose infants succumbed in this neonatal period. The probabilities of death are:—

	Chances of death per 10,000 deliveries.
Infant only	558·2
Mother only	15·6
Both mother and infant	11·3

Septicæmia was the most important cause of death of mothers delivered of live births and toxæmia of the deaths of mothers of stillborn infants. It is to be remembered that in the American system of determining the cause of death by a list of preferred causes septicæmia takes precedence over all other causes and so becomes the primary cause of death whenever it is mentioned on a death certificate.

THE PRESIDENT PROPOSES HOSPITAL CONSTRUCTION

Just before Christmas President Roosevelt announced a programme for the construction of hospitals and medical centres in communities which now lack hospital facilities and are too poor to construct them themselves. The government is to build these hospitals, retaining title to them but turning them over to local administration subject to the maintenance of standards which must be satisfactory to a central council of medical experts who will be placed in charge of the plan. In making this proposal the President rejected the Wagner Health Bill which was introduced into the last session of Congress and is still in a committee of the Senate. The Wagner Bill has been generally considered to be the fulfilment of the proposals made at the National Health Conference in the summer of 1938 but in the present state of the country's finances the President believes this bill would be too expensive. The hospital construction plan is a much more modest approach to the problem of medical care. It is indicated that not more than fifty hospitals would be built as a beginning. The immediate response to this announcement has been favourable both from the spokesman of organised medicine, Dr. Morris Fishbein, and from the *New York Times*, which has not always agreed with Dr. Fishbein's viewpoint. This paper points out that the commission of experts to which the President will assign the task of indicating where the hospitals are to be built may be regarded as a nucleus of a federal health authority "which must ultimately be created not only to grant federal money but to formulate and maintain medical standards."

EXPERIMENTS IN HEALTH INSURANCE

New plans for voluntary health insurance continue to find expression. The most important of recent organisations and one which may well set a standard for the country has been launched in Boston under the auspices of a corporation called Health Service, Inc. This plan is described in the *New England Journal of Medicine* (1939, **221**, 911). Members of the association will consist only of individuals and their dependants whose family income is less than $3500 a year. Members will be accepted only in groups. The association will offer to its members professional medical service in the home, in the doctor's office, and in the hospital. This service will include not only the advice of general practitioners and pædiatricians but also the services of competent consultants in every field. Among the signatures to the letter announcing this plan is that of Dr. Hugh Cabot, whose book "The Patient's Dilemma" to be published here on Jan. 19 describes in lively and popular language the advantages to be derived from the group practice of medicine. In New York state two or three new plans for health insurance have already been approved, and in the metropolitan area of New York city two non-profit corporations have been formed, one of which is to pay the physician a stated percentage of the premiums collected from those subscribers who are his patients, and the other is to operate on the unit plan.

NORWAY.

(FROM OUR OWN CORRESPONDENT)

QUACK ADVERTISEMENTS IN THE OSLO PRESS

There are two kinds of quack advertisement in the daily papers published in Oslo, the explicitly nominative and the evasively anonymous. The former are presumably the more respectable. Respectability can also be gauged in terms of systems. At the quasi-orthodox and almost quite respectable end of the list are the nature doctors and health practitioners, while at the disreputable end are the "wise women" and seers, not to mention fortune-tellers. In the *Journal of the Norwegian Medical Association* for Dec. 1, there is an illuminating account of a movement to boycott all quack advertisements in the daily press. It was started by a group of lay journalists who appealed to their employers to make a combined stand against this nuisance. The newspaper proprietors professed their willingness to deny themselves the

profits from this particular source if all the papers agreed to join in the ban, and if it could be shown not to run counter to the anti-trust law of March, 1926. Accordingly, the body responsible for the interpretation of this law was consulted, and its ruling exonerates any newspaper proprietor who refuses the advertisements of a chiropractor. If the boycott should seem harsh, it should be noted that even a fully qualified doctor whose medical degree is not Norwegian is just as much subject to the restrictions to which out-and-out quacks are liable.

THE HUNGRY NORTH

A generation or two ago, the young medical men sent to the north of Norway to serve a rather dismal apprenticeship in the service of the state had for the most part no special training in preventive medicine and little knowledge of dietetics, pædiatrics or other specialties. It was a rough-and-tumble life, with first aid and obstetrics in high relief, and poverty out of all belief. The poverty is there still, probably as bad as ever, but the medical outlook and standards have changed. The doctors are now certain that appointments will be found for them in the south after they have done their time in the Arctic regions, and many of them are now on the way to being specialists in some subject or other. The result is a small but stimulating stream of reports on research carried out under exceptionally difficult conditions. A typical example is the report published in *Tidsskrift for Den Norske Laegeforening* by Dr. J. Bremer and Dr. H. Lid, who have collaborated in the medical examination of several hundred school-children in Lödingen. The ages of these children ranged from 8 to 15 years. Their parents were for the most part fisher folk on small farms, and the élite were represented by pilots and telegraphists. In addition to routine measurements of height, weight and so on, certain special tests were carried out, such as the sedimentation and tuberculin tests, hæmoglobin determinations and radiological screening with radiography in suspect cases. The report leaves no room for complacency. As many as 55 per cent. were under the ideal weight, and over 20 per cent. were seriously under-weight. In 64 per cent. the teeth were bad, and in over 7 per cent. signs of rickets were demonstrable. The dietary was considered faulty in over 74 per cent., the most serious deficiency being found in fruit and vegetables, 65 per cent. eating no fruit at all. Little wonder, therefore, that tuberculosis finds such congenial soil in the north. It is to be hoped that this exposure will be used as a stick to beat those who oppose the necessary reforms.

IN ENGLAND NOW

A running commentary from our Peripatetic Correspondents

"War = waste, and the country that wastes least will win this war." Such is the aphorism of the elderly consultant who lives, in semi-retirement, in our suburb. In the last war he took, as he thinks, a great part. He has spent much time in the last twenty years trying to get others to think so too. He used to laugh at the old people who had tried to do their bit; now, being labelled too old for the R.A.M.C. and too decrepit for A.R.P., he finds himself one of them and tries himself to do his many little bits. He button-holes any young doctor, just joined up, and tries to give him the benefit of his experience, though he knows at the bottom of his heart that the young man will learn by actual practice in a week more than he could teach him in a year. But he still does it, and goes to bed happy when he thinks he has planted an idea in a youngster's mind that will help a wounded man, or keep a Tommy fit. He also writes letters to the press. There is hardly a day in which he does not see something in a paper, professional or daily, about which he feels the world should know his views. Most of these letters are not written—there is no time for them—and of those that are, many are not sent. Reading them in the morning he does not find that brilliancy that he thought was there when he wrote them overnight. Most of all he enjoys writing to the *Times*. He opens this paper with eagerness to see if his letter is there. It was once and he had something to talk about for a month. "As I said in my letter to the *Times*" was the start of his every conversation. He cut it out of his copy and put it in a scrap-book; he bought an extra copy and sent it to his mother who forwarded it to his sister in South Africa. But when his letter is not published, he is just as pleased. He sighs a sigh of relief and thanks his stars he has not made the ass of himself that the other man did whose letter he had answered.

All this is in addition to his war on waste. Paper is his specialty. On the outbreak of war he found an old pillow-slip which he hung on a hook in his study and into this he has put every letter he gets neatly torn into four. The pillow-slip is nearly full and he is thinking of replacing it by a bolster-case. Under the sofa in his room he has put two empty packing-cases; into one he puts all sorts of brown paper, wrappings, bags and corrugated cardboard, and into the other all undefined bits of paper such as advertisements from the proprietors of drugs, the *Radio Times* with the fasteners neatly removed and medical journals other than the *Lancet*. He knows he must dispose of the contents before spring-cleaning, for then in all probability the cases themselves will be removed. The *Lancet* and the *Times* he files in order of their issue. This is not only economy, it is to him a final victory after a struggle of thirty years. In times of peace these files are called untidy and are labelled dust-accumulators. Now he files them afresh each week, for somehow they always seem to get out of order. Every week he forgets whether he has them with the latest issue at the bottom or on top, and is as like as not to change them round. Thus only the *News Chronicle* and the *Evening News* are left for household uses such as lighting fires, doing the flowers, lining drawers, and stuffing into the toes of his shoes when they are wet. These last bits are used again, being buried, on the advice of Mr. Middleton, in the backyard, in the hope that they will form manure for the runner beans that he proposes to plant there.

His greatest delight comes from envelopes. All these he keeps and uses again, sometimes exercising the nicest judgment as to which is suitable for a particular correspondent. He feels that he is setting an example that government offices will soon follow. He opens all letters with a paper-knife with great care, levering up the flap or cutting the end most tidily, so that he can gum them down again with stieky paper. This done he adds the word "from" before his name, and crosses out the old address, writing the new one on the other side. Sometimes the erasion is not efficient and the letters are returned to him. Once the servant had to pay threepence for a letter with a used stamp, having failed to show the postman the new one on the other side. With Christmas past he

is revelling in envelopes of all sizes, each with gum still on the flap, for they are the ones the cards were sent in. He is determined they shall be used again before being handed to the Boy Scouts. But he will have to write a lot of letters, for spring-cleaning will see the end of them, and from remarks about how dirty everything is this threatens to be early this year.

I cannot say what happened at Guy's at Christmas, because for nearly the first time since 1903 I did not go there. I had been working hard and wanted a rest, and I think also I rather dreaded it. It is all so different with Guy's House shut down, and only overcrowded floors in some medical wards where beds have been put between the other ones. It will rise again like the Phœnix from its ashes; but the ashes in the tale must have been rather sad to those who knew and loved the former Phœnix.

* * *

The Middlesex students have left Bristol, just as we were getting to know them and they us. We had an address by Samson Wright to our Medico-Chirurgical Society while they were here, which was much appreciated, and today we have tapped another of our war-time visitors—Whitby, who is here with the blood-transfusion service. He talked about sulphanilamide and its derivatives with their clinical application. These are some of the profits we have sucked out of the war so far.

As you know, the Bristol Health Committee are submitting plans to the Ministry of Health for a new health centre in Lower Ashley Road, to cost £24,000. The development of these clinics is interesting to follow. It began with one central clinic where all the various departments were to work, such as T.B., school medical work, infant welfare, antenatal and all those services which are under the control of the health authority. Gradually it has become apparent that similar clinics are needed in various outlying sectors; one or two have already been built, but for the most part they have been held in school-rooms and church or chapel halls. They certainly attract the patients. Of course if these clinics are to go on they must have premises constructed specially for them. Really what they are doing is to replace or to anticipate the construction of dispensary or hospital O.P. departments. As the city grows these O.P. departments seem to be necessary. We can't pay for all that is wanted by the voluntary method. Here's an example.

On Jan. 1 the maternity departments of the Royal Infirmary and General Hospital closed down, because under the new C.M.B. regulations the voluntary hospitals could not face the expense. In future all maternity work, both "on the district" and in the maternity wards, will be transferred to Southmead Hospital and the municipal authority. The health department will train all pupil midwives and maintain certain district midwives. We may not like it, but the money was not forthcoming to continue at the voluntary hospitals. Arrangements for student attendance have been made and actually all the members of the B.R.I. and B.G.H. staffs are on the visiting staff at Southmead. These developments are interesting because I believe we are blending the voluntary and the state hospitals with the minimum of disturbance or friction.

* * *

The Welsh National School of Medicine had its own problem of evacuation. With the beds at the Cardiff Royal Infirmary more than halved, it was called upon to provide for an increase by a third in the personnel of the clinical years as the result of an invasion of fourth-year students from University College Hospital and a number of European refugees. This it managed to do, partly by relaxation of the Ministry's ban on civilian admissions to hospital, and partly by using the excellent clinical material in hospitals willingly put at the disposal of the school by the city council. In addition 100 second- and third-year students of University College have been successfully absorbed into the departments of anatomy and physiology. Laboratory teaching in pathology was the biggest problem. The school has a new pathological institute in course of construction in the grounds of the Infirmary, which is proceeding, at materially increased cost because of the war, but it cannot be ready for occupation before the lapse of a year. Fortunately a vacated Territorial drill-hall was put at the school's disposal and ingeniously and economically equipped for this purpose by the pathology department. A hostel was found for some of the University College students and the influence of the infiltration of these London students and their young clinical teachers is one which the school appreciates. At the outbreak of war it was uncertain whether postgraduate teaching could go on. It soon became apparent that there would be applicants for the courses for the tuberculosis diseases diploma, but it was doubtful whether the younger graduates who usually study public health would be available. The non-explosive character of the war and the view expressed by the Ministry of Health that qualifications in public health should, if possible, be obtained settled the issue. Courses for the D.P.H. and the T.D.D. have therefore begun with the New Year. For similar reasons, the class for health visitors which had also been suspended has reopened with a full complement of pupils, those who are members of the Civil Nursing Reserve being exempted from mobilisation for its duration.

* * *

The medical superintendent signed the E.M.S. forms M.P.C. 45 and 47, and sent off the day's summary of beds occupied, beds empty and beds available at twenty-four hours' notice. Then he turned his mind to practical medicine, and ordered a thousand M. & B. 693. A few days later he received a note from the central authority, informing him that requisitions for stationery must be made on the special form for the purpose, PQX 99.

NOMENCLATURE OF BLOOD-GROUPS

AT the meeting of the Health Committee of the League of Nations in November the Danish member said that authoritative British medical journals had recently published articles in which the old nomenclature of blood-groups was used. The committee subsequently passed a resolution drawing attention to the recommendation made by the Permanent Commission on Biological Standardisation in 1928, and pointing out that, "especially in present circumstances," the use of a uniform nomenclature is likely to obviate mistakes which might have serious consequences.

In 1928 the permanent commission recommended the international use of the nomenclature proposed by von Dungern and Hirszfeld, in which the groups are designated O, A, B and AB. These bear the following relation to the Moss and Jansky systems:

von Dungern and Hirszfeld	O	A	B	AB
Moss	IV	II	III	I
Jansky	I	II	III	IV

They also recommended that test-sera should be designated A (anti-B) and B (anti-A), test-serum A being placed in white glass containers and test-serum B in brown. They urged that each institute which supplies standard sera should adopt this nomenclature only and that the editors of scientific journals should insist on its exclusive use.

PUBLIC HEALTH

AN OUTBREAK OF BACTERIAL FOOD-POISONING

By E. Hinden, M.B. Camb., M.R.C.P.
ASSISTANT MEDICAL OFFICER AT ST. CHARLES' HOSPITAL (LONDON COUNTY COUNCIL)

An attack of food-poisoning broke out in one of the children's wards at St. Charles' Hospital on June 8, 1939. There were 14 children in the ward; 3 were bottle-fed infants (2 aged five months and 1 four months) and were not at risk. The remaining 11, on a mixed diet, all contracted the disease. Of these, 4 vomited after their dinner on June 8. This meal was served between 11 A.M. and noon and consisted of minced meat, vegetables, and mashed potatoes, followed by a milk rice pudding. Some children had minced chicken in place of the minced meat. One other child (case 2) had a rise of temperature that evening. June 8 was very hot, and the children had been out in the sun; this was thought to have caused the vomiting. The next day all the children seemed well, except the child with fever; but on the 10th every child had a high temperature and appeared ill, and 6 of them had loose, frequent, and offensive stools. Of the remaining 5 children 2 had vomiting without diarrhœa, but the other 3 had no gastro-intestinal symptoms. The stools of all the children were examined bacteriologically, and *Salmonella aertrycke* was found four times—twice from one child. Of these children cases 3 and 4 definitely had food-poisoning, and the other child (case 1), from whose fæces the organism was twice recovered, had fever but no gastro-intestinal symptoms. The fæces of 3 children contained blood and mucus, and 2 mucus. Cases 8 and 11 developed an enlarged spleen, and cases 5 and 8 severe urticaria. Half the children were well at the end of the week, but the other half had pyrexia for a second week. Only 1 child caused serious anxiety, but she recovered. The accompanying figure shows the time-relations of the outbreak.

CASE-RECORDS

All the children had been in hospital for some weeks, for the ward is used not for recent admissions but for children whose stay has exceeded three weeks. The ages of the children ranged from 9 months to 2½ years.

Case 1.—A girl, aged 20½ months, admitted on May 9 with gastro-enteritis. At this time her stools were normal. Her temperature began to rise on June 7, before the outbreak, and reached its maximum on the 8th. She showed no signs of gastro-intestinal disorder till the 14th, when she had three stools; but her motions contained *S. aertrycke* on the 13th and on the 19th. She was never very ill. The first motion was examined as a routine, not because of symptoms. She had been a little "off colour" on the 8th, 9th, and 10th.

Case 2.—A boy, aged 23 months, admitted on May 8 with impetigo. His temperature rose on the evening of the 8th and remained high till the 13th, at times reaching 103·4° F. He appeared very ill during these days but had no intestinal symptoms; he was rather costive. He did not vomit. His stools showed only late lactose fermenters.

Case 3.—A girl, aged 20 months, admitted on March 5 with pneumonia. On June 8 she vomited; her temperature rose on the 9th and remained high till the 13th, during which time she had loose frequent stools, and she passed a little blood on the 14th. Her stools contained *S. aertrycke* on the 14th but on no other occasion. She was not very ill.

Case 4.—A girl, aged 9½ months, admitted on April 28 with impetigo and scabies. She was the youngest member of the ward and the most seriously ill. She vomited twice on June 8, and diarrhœa started on the night of the 9th. She was dangerously ill with diarrhœa and vomiting and had fever to 104° F. till the 12th, after which she improved. Her stools on the 12th contained blood and mucus, and *S. aertrycke* was grown from them. She lost 27 oz. in ten days and had not regained this weight by the end of four weeks.

Case 5.—A girl, aged 18 months, admitted on May 9, 1938, with tracheitis and bronchitis, hydrocephalus, and mental deficiency. She vomited once on the 8th, thrice on the 10th, when she also had diarrhœa and fever. She was ill till the 15th. On the 14th and 15th she had severe urticaria. Her temperature did not settle till the 20th, but she often had a low fever of undetermined origin.

Case 6.—A boy, aged 27 months, admitted on Jan. 13 with hydrocephalus and mental deficiency. He had the same rise in temperature as the other children on the 10th and was lethargic and did not eat well for three days but had no specific symptoms. He soon recovered.

Case 7.—A boy, aged 15 months, admitted on April 24 with bronchopneumonia. Diarrhœa started on June 9 and was very severe on the 10th, when he passed eight watery offensive stools, two of them containing blood and mucus. His temperature was not high. He was ill for five days, and his temperature did not settle down for another week.

Case 8.—A girl, aged 15 months, admitted on March 30 with dermatitis due to scabies. She had high fever on June 10, when she vomited twice. She vomited again the next day, but she had no diarrhœa. On the 14th she had severe urticaria, and her spleen was palpable on the 16th. Her temperature took a long time to settle. She was quite ill at the height of the attack.

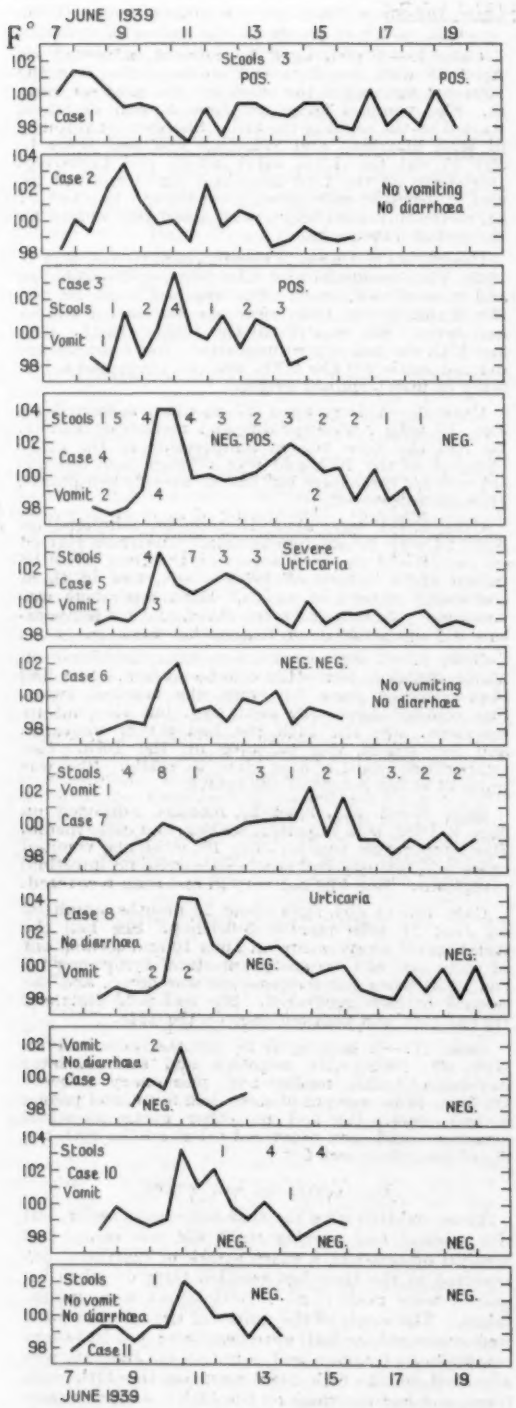
Case 9.—A girl, aged 23 months, admitted on Nov. 9, 1938, with impetigo, scabies, and otitis media. Her temperature rose on June 10, when she vomited twice and had one bad stool—otherwise no intestinal symptoms. She was not very ill and soon recovered.

Case 10.—A girl, aged about 24 months, admitted on Jan. 21 with mental deficiency. She had the usual rise of temperature on June 10 and seemed out of sorts but had no gastro-intestinal symptoms till the 12th, when her temperature was down, and she seemed to have recovered. She had mild diarrhœa till the 15th and vomited once on the 14th.

Case 11.—A boy, aged 27 months, admitted on Nov. 22, 1938, with impetigo and scabies, later developing otitis media and pulmonary fibrosis. On June 10 he was out of sorts, had fever, and passed a bad stool. He had no other gastro-intestinal symptoms and soon recovered; but on the 20th the tip of his spleen was felt.

CASUALTIES ON THE STAFF

These children were the only patients to suffer, but the medical and nursing staffs did not escape; 2 medical officers had a sharp attack of diarrhœa, not reported at the time but recalled later on when inquiries were made; no investigations were undertaken. The stools of the nurses of the affected ward were examined, and all were negative; yet 1 of them complained of nausea and vomiting on June 10, was admitted to the Sick Staff ward on the 11th with fever, and had diarrhœa on the 12th; 4 other nurses complained of diarrhœa. The first nurse was put to bed on June 11 with fever of 100·8° F., having had diarrhœa since the 8th. Nothing abnormal was



Charts of 11 children with salmonella food-poisoning. POS, *S. aertrycke* found in the stools; NEG, *S. aertrycke* not found in the stools.

found in her stools. The second nurse was warded on June 16 with fever of 101·8° F.; she had had diarrhœa since the 9th. Bacteriological examination was negative on the 16th and 20th, but the third specimen examined, on the 25th, contained *S. aertrycke*. The third nurse was warded on June 17, having had diarrhœa since the 12th. Her diarrhœa was better, but she was giddy and weak; she had no fever. A stool passed that day contained *S. aertrycke*, and this same organism was also grown from her urine on the 21st. (However, this specimen was not a catheter specimen.) The fourth nurse first reported sick on June 12, with a rash on her arms and the front of her neck. This cleared by the 16th, but on the 17th she fell ill with headache and shivering and fever of 102° F. She complained also of epigastric pain and vomited. On the 20th she had blood and mucus in her stools, and on the 24th *S. aertrycke* was grown from them. Besides these 5 nurses who were warded, 6 others also suffered from mild diarrhœa but did not report it. Of the 5 sick nurses 4 were on night duty, but all attempts to incriminate a common article of food failed.

TREATMENT

The youngest child (case 4) was treated as follows. She was given only boiled water for the first day, then protein milk 1 oz. three-hourly, with half-strength saline between feeds. On the third day this was increased to 2 oz., and so on gradually increasing the feeds and diminishing the salines till she was taking only protein milk. All the other children were given water the first day, apple-pulp the second, Horlicks and ground-rice pudding made only with water on the third, and then milk was gradually added to the diet. All the children made a good recovery. Drugs were not used, though Levaditi et al. (1937) have shown that certain sulphonamide derivatives can protect mice against the endotoxins produced by *S. aertrycke*.

DISCUSSION

In 1923–37 there were 299 outbreaks of salmonella food-poisoning affecting 4418 people, of whom 102 died; *S. aertrycke* was responsible for 169 of these outbreaks. This gives an average of 20 outbreaks yearly, with 295 cases and 6·8 deaths; the case-mortality is 2¼–2½ per cent. The figures for 1937, the last available, are 45 outbreaks with 601 cases and 24 deaths. These figures are taken from the annual reports of the Chief Medical Officer of the Ministry of Health (1932–37), and it is noted in these reports that the figures given are probably too low. Excellent accounts of the disease have been given by Perry and Tidy (1918), Savage and Bruce White (1925), and by Scott (1937), who clearly distinguished between two types: one type, caused by ingestion of preformed toxin, has a short incubation period (four to six hours), is ended in twenty-four to thirty-six hours, and has a very small case-mortality, and bacterial examination of the stools is negative; the second type, caused by swallowing living bacteria has a longer incubation period (twelve to thirty-six hours), lasts longer, and has an appreciable case mortality, and the organism may be recovered from the stools. The outbreak here described fits in well with these descriptions, but the following points are distinctive:

(1) Every child at risk contracted the disease.

(2) Urticaria—Perry and Tidy (1918, 1925) found no rashes in 1060 cases.

(3) Two patients developed enlarged spleens. This, too, was not found in Perry and Tidy's series, probably because the spleen enlarges more readily in children than in adults.

The clinical sequence of events in the present outbreak is interesting. The 4 children who vomited within a few hours of the infecting meal probably ingested a large dose of preformed toxin, and the disease caused by this toxin had already passed over by the following morning; the rise of temperature thirty-six to forty-eight hours after the meal was due to the multiplication of living bacteria and developed in all the children at the same time. In the 1 child (case 1) whose temperature went up on June 8 and stayed up, the "toxin" disease passed over into the "bacterial" disease without a break. Some children were obviously ill with an infection but showed no gastro-intestinal upset, whereas others, and 1 nurse, had diarrhœa when the temperature had fallen and they had apparently recovered (see figure).

The cause of the outbreak was not discovered. By June 10, when food-poisoning was suspected, none of the food eaten on the 8th was available. Bacterial examination of the milk churns and of a mouse found near the affected ward (*S. aertrycke* is also known as the organism of mouse typhoid) gave negative results.

SUMMARY

(1) An outbreak of food-poisoning, caused by *S. aertrycke*, occurred in a hospital ward.

(2) Of the 14 children in the ward 3 were bottle-fed and escaped; all the other 11 children contracted the disease.

(3) Of the staff 2 medical officers and 11 nurses had diarrhœa; 5 of the nurses had to be put to bed.

(4) *S. aertrycke* was found in the stools of 3 of the 11 children and 3 of the 5 nurses who were warded.

(5) Enlargement of the spleen was noted in 2 children; urticaria in 2 children and perhaps in 1 nurse; and 3 children and 1 nurse passed blood in their motions.

(6) There were no deaths.

(7) The cause of the outbreak was not discovered.

I have to thank Sir Frederick Menzies, chief medical officer of the London County Council, and Dr. Basil Hood, medical superintendent of St. Charles' Hospital, for permission to publish this article; and Dr. G. W. Goodhart, pathologist to the Western Group Laboratory, London County Council, for the bacteriological examinations.

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Cerebrospinal Fever in Wrexham

An epidemic of cerebrospinal fever began in the Wrexham district on Nov. 13, and so far 25 cases have been admitted to the fever hospital. The cases came in fairly regularly up to Nov. 30, when there was a gap of six days; 5 cases were then admitted within five days and this was followed by an interval of seventeen days, since when civilian cases have been admitted fairly regularly except for one interval of nine days. A substantial proportion of the cases were extremely acute on admission, but with the exception of 2 fatal ones there has been a satisfactory response to treatment, even though one patient was unconscious for four days. The epidemic up to Dec. 9 was confined with 2 exceptions to non-civilian men and women, but from Christmas Day onwards only civilians have been affected. In the latter group, all but 2 were scattered isolated cases from various parishes on the circumference of the borough, and this points to the source of infection being in the borough. The treatment has been with M. & B. 693, with lumbar punctures and serum intrathecally, and the response has been striking. There has been a relative absence of complications. Certain cases suffered from vomiting, but this was controlled by sodium bicarbonate, and in one case was stopped when M. & B. 693 was replaced by sulphanilamide. One patient suffered from temporary deafness and one non-civilian suffered from acute neuro-labyrinthitis, which has resulted in intractable labyrinthine deafness. Lumbar puncture has proved valuable in differential diagnosis; in treatment, by relief of high pressure symptoms and drainage; and in prognosis, progressive improvement in the characteristics of the fluid withdrawn being certainly of prognostic importance. There have been two deaths, one on the fourth day and one ten minutes after admission to hospital.

From the administrative point of view several points have emerged. The closest coöperation with the military authorities is invaluable and essential, and the epidemic can be controlled much more easily in military establishments than when cases are scattered in a large rural area. The tracing of carriers has proved impossible in a large population containing a substantial proportion of military. Infection is liable to be spread to other areas by persons travelling during an incubation period; 7 such cases at least have been brought to the attention of Dr. T. P. Edwards, the medical officer of health, and one of these has proved fatal.

As stated in Dr. H. S. Banks's article in The Lancet of Jan. 6 (p. 42), the modern chemotherapeutic measures by M. & B. 693 are a definite advance and have proved invaluable in treatment. Cases have done so well with serum and M. & B. 693 that it was not thought advisable to experiment by relying solely on drugs. The necessity of taking all precautions against infection is shown by the fact that a nurse who was attending institutional cases before admission to the infectious diseases hospital developed the disease.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED DEC. 23, 1939

Notifications.—The following cases of infectious disease were notified during the week: Smallpox, 0; scarlet fever, 1072; whooping-cough, 734; diphtheria, 813; enteric fever, 15; measles, 1772; pneumonia (primary or influenzal), 454; puerperal pyrexia, 115; cerebrospinal fever, 26; poliomyelitis, 4; polio-encephalitis, 2; encephalitis lethargica, 1; dysentery, 38; ophthalmia neonatorum, 59. No case of cholera, plague or typhus fever was notified during the week.

Deaths.—In 126 great towns, including London, there were no deaths from smallpox, 1 (1) from enteric fever, 3 (0) from measles, 2 (1) from scarlet fever, 1 (0) from whooping-cough, 17 (1) from diphtheria, 28 (1) from diarrhœa and enteritis under 2 years, and 27 (4) from influenza. The figures in parentheses are those for London itself.

Fatal cases of diphtheria were scattered over 11 great towns, Huddersfield reporting 3 deaths, Carlisle, Sunderland, Wallasey and Wigan each 2. Birmingham had 7 fatal cases of diarrhœa.

The Board of Education reminds parents of evacuated children that the "milk in schools" scheme is still in operation in many of the reception areas. A postal order for 1*s.* should be sent to the teacher or billeting householder. It will cover the cost of one-third of a pint of milk on each school-day for a month.

LETTERS TO THE EDITOR

THE MIND OF HITLER

SIR,—I have read the interesting article in your issue of Jan. 6, "A Psychiatrist Looks at Hitler" (but why anonymous?), and find myself in close agreement with almost all that it contains. There can be little doubt in the minds of all psychiatrists who have studied "Mein Kampf," and have listened to the broadcast speeches of the author of that revealing autobiography, that Herr Hitler is a "hysterical personality." His own description of the onset of his blindness from Gelbkreuz gas near Ypres in the night of Oct. 13–14, 1918, and of its temporary recurrence only a month later when he heard the news of the armistice—"Während es mir um die Augen wieder schwarz ward, tastete und taumelte ich zum Schlafsaal zurück" ("Mein Kampf," p. 223)—indicates a tendency to functional nervous dissociation, and his revivalist methods with his public audiences are the marks of the mediumistic medicine-man. But his continued success within Germany during the past seven years indicates a degree of both conscious and subconscious psychological skill, and a tenacity of purpose, which lifts him into a higher category than that of the merely hysterical. While I would not diagnose him as a paranoiac (although he may be one), I consider that his fanatical pertinacity along certain lines of thought and action indicates a strong "paranoid tendency," manifested not so much in any overt delusions (although the delusions even of a paranoiac who has successfully evaded all attempts at certification may be extremely difficult to demonstrate or detect), as in a more fundamental tendency to project upon the world around him his own aggressiveness. Moreover, his growing megalomania, with messianic feelings which make his followers paranoid and encourage a collective paranoia of his nation, fits into the same picture.

In my opinion, it was this tendency in Herr Hitler which suddenly converted him to the strange reversal of policy shown in the Soviet-German pact. His paranoid fear of encirclement became so intense after English and French declarations of policy in March, 1939, and his accompanying aggressiveness so magnified, that the unbearable mental tension could only be relieved by a "retreat to Moscow," which will ultimately prove as disastrous to his career as the events of 1812 were to that of Napoleon.

I am entirely in agreement with the statement in your leading article that "the real problems lie behind his individual personality and are concerned with the disease of which he is a prominent and ugly symptom," and with Dr. Davie's thoughtful discussion of the "collective" or racial unconscious of the German people in this connexion. But the whole question of "Hitler and German people" as a unitary problem needs more data for its solution than are at present available.

I am, Sir, yours faithfully,

WILLIAM BROWN,
Director of the Institute of Experimental Psychology, University of Oxford.

Harley Street, W.1.

LE MOT JUSTE

SIR,—In these days of restricted foreign imports and general economy, may I protest at the appearance in your issue of Jan. 6 (p. 7) of the expression "intra-abdominal pathology" where the meaning is "abdominal disease," at the use for the thing intended of the name of its science—here, presumably, the narrow field of that diminutive person (specialisation reduced to absurdity) the Intra-Abdominal Pathologist.

I am, Sir, yours faithfully,

PHILIP S. BUCKLEY.

Claybury Hospital, Woodford Bridge.

"THE NEED FOR PRACTICAL EUGENICS"

SIR,—I have read the leading article under this title in your issue of Dec. 30, 1939, with much puzzlement and with as much concern. It seems to me inconceivable that THE LANCET can seriously be advocating the policy indicated in sentences such as the following: "Society cannot but benefit in the long run from family restriction by those of its members who do not wish for, and cannot adequately bring up, more than one or two children." The right course is not to accept defeat at the hands of a badly organised society, and thereupon to require the citizen who is its victim to be even more a slave by cutting him off from family life, but to take the field against the social system itself. To talk, again, so easily of "the possibility of voluntary sterilisation as the safest and by far the most convenient method" as one "not to be neglected" is, in fact, to accept a materialistic basis for society and to forget personal responsibility and capacity for self-control. Again, taking the last sentence of the article, how is the individual to secure "the continuance of the happy, the healthy and the intelligent"? How is he to know whether they will be in any one of these categories until they have arrived and had an opportunity of developing their own capacities with his help? However plausibly this article appears to be considering the interests of the individual, it is, in fact, treating him as a mere pawn in some fine-spun scheme of alleged physical improvement of the race.

I am, Sir, yours faithfully,

H. P. NEWSHOLME.

Birmingham.

*** The article could also be read as a clash between what is individually desirable and what is economically possible.—ED. L.

The Lancet 100 Years Ago

Jan. 18, 1840, *p.* 620.

From a leading article.

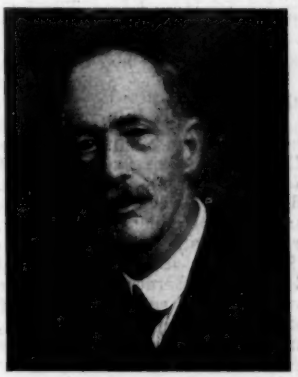
The profession is deprived of all efficiency and useful influence by the subdivision into several licensing bodies; conferring the same title after the application of different tests, and different titles and ranks after the same or similar examinations. In London, the College of Physicians examines only in physic, excluding what is called surgery from pathology, as well as from therapeutics. Its licentiates are bound to abjure the practice of surgery. By the by-laws no accoucheurs could become Fellows of the College. Sir CHARLES MANSFIELD CLARKE, accoucheur by grace of the ladies, and physician by grace of his Grace the ARCHBISHOP of CANTERBURY, was brought into the medical world, and baptized, by the venerable head of the church, who still retains the miraculous gift of physical regeneration. The College of Surgeons excludes accoucheurs from the Council, and examines in anatomy, mechanical injuries, and what has been absurdly called external pathology. The Apothecaries' Company does not examine in surgery or midwifery; and it is to be feared that the majority of the examiners at all the colleges are very ill-qualified men, and have performed their tasks very imperfectly.

OBITUARY

JOHN MIDDLETON MARTIN

M.D. CAMB., L.S.A., D.P.H.

Dr. Middleton Martin, who died at Cheltenham on Dec. 30 in his 70th year, was the first whole-time medical officer of health (1903–37) for Gloucestershire. He retired two years ago still active in body and mind. Born at Exeter in August, 1870, son of John May Martin, he was educated at Exeter School and Cambridge, where he took a first class in the natural sciences tripos and was a scholar of Peterhouse, before completing his medical studies with distinction at University College Hospital. Qualifying in 1896 he was resident at the Hospital for Women, Brighton, before studying for the D.P.H. and his association with Gloucestershire began with his appointment to the Stroud R.D.C. He soon had similar appointments at Nailsworth and with the Stroud urban district, with charge of the joint isolation hospital. In 1903, after having done pioneer work in organising medical inspections of school-children, which resulted in an experimental scheme with 7000 children at 44 schools, he was offered the county appointment. It was then that his qualities began to show at their best. It was not true, as some said, that he had an official mind; it was just that he took pains in all public-health matters to use existing agencies and was therefore successful in bringing into common local action the practitioners, the nursing associations, the hospitals and their staffs.



Elliott & Fry.

His success in this direction led to the signal honour of having his scheme cited in the Dawson report as the prototype of the future provision of medical and allied services. There was in this report a diagram of an area showing health centres, primary or secondary, combined in one comprehensive plan; alongside this diagram appeared Middleton Martin's plan of Gloucestershire mapped out into areas. And it was noted that the local urban authorities, the hospital authorities, and all the doctors had agreed on a scheme of services similar in its aims to the one set forth in the report. In other directions Martin was equally active. On the passing of the Midwives Act in 1902 he was appointed executive officer for the county and succeeded in producing order and efficiency where half-hearted coöperation had been the rule. He reported to the interdepartmental committee on the results of his inspection and feeding of children attending public elementary schools and the Board of Education commended his continuous records of nutrition to the imitation of other medical officers. He was active in initiating maternity and child-welfare work and made an early survey of health visitors in the county. He had a natural aptitude for preparing statistical material and three years ago he reviewed the public-health services of the county over half a century in an arresting way. His character comes out clearly enough from the record of his work. He was overflowing with nervous energy and his high standard was applied first to himself. Conscientiousness, honesty and unfailing kindliness were the qualities patent to those who knew him best and who found him the staunchest of friends. Within was a mind finely tempered, fastidious, sensitive indeed to a degree which must have been irksome to a public officer. No wonder he became the counsellor and friend of all branches of the medical profession in Gloucestershire.

Dr. Martin married in 1901 Louisa, daughter of Robert Holmested Rolfe, of Bocking, Essex. He leaves a widow and a daughter.

HERBERT CHARLES

M.R.C.S., D.A.

THE death in London on Jan. 13 of Mr. Herbert Charles, the anæsthetist, is a great loss to the profession. Genial, generous and exceedingly kind-hearted Charles, as a young man, was gifted with a fine physique and great strength and endurance. In those early days he was well known as a racing cyclist and for a while held the world-records for 12 and 24 hours' tandem riding on the road. Entering the profession at a later age than most students he received his medical education at Middlesex Hospital, qualifying in 1906, and after a house-surgeoncy there he became one of its honorary anæsthetists, holding the appointment up to its age-limit when he was placed on the consulting staff. A keen freemason, he was the first anæsthetist appointed to the Royal Masonic Hospital when that institution was founded and he continued active in its service to within three weeks of his death.

Mr. Victor Bonney writes: In assessing the calibre of an anæsthetist technical ability, the faculty of what is called clinical instinct, and temperament have all to be taken into account, and judged on this standard Charles was a very great anæsthetist indeed. Equally at home with the drop-bottle and the "Clover" as with the complicated apparatus that has replaced them, and adept in all the various forms of inhalation and injection anæsthesia, he combined in himself the virtues of both the older and newer schools of thought in the practice of anæsthesia. It is unfortunate for our profession that, as advance succeeds upon advance, it too often happens that the old is so utterly put aside that not only its faults but its merits too are consigned to oblivion. With each step forward we generally slip back a little as well. The disuse of chloroform, which for certain operations is still the best of all anæsthetics, is an instance, and the death of Charles diminishes the already small band of expert chloroformists. Though the faculty of what is called clinical instinct can up to a point be acquired, yet in its highest degree it is a gift beyond observation and study: a power peculiar to a few individuals, not communicable to others, and in its origins not understood by the individual himself. An anæsthetist who has this gift is like a steersman sensing the rocks and shoals in an uncharted sea and Charles possessed it. His temperament was ideal for his calling, never ruffled or flurried or uncertain, whatever the surprise or emergency, and steady as a rock under all conditions. By force of circumstance every anæsthetist, more or less, becomes particularly expert in certain classes of case, and some may even be termed specialists within their specialty. Charles, though truly a general anæsthetist, had exceptional practice

in the surgery of the breast and pelvis. His experience of Wertheim's operation was far beyond that of any other anæsthetist, for he administered full ether with spinal anæsthesia to between 500 and 600 patients undergoing that operation without a death—a remarkable record. A surgeon looking back over many years on his work in the operating theatre, with all its strenuous endeavour, must with a humble and grateful heart acknowledge how much of his success has been due to the self-abnegating and often poorly acknowledged work of those who, at the anæsthetist's end of the table, with the patient's life in their hands, made that success possible. The writer feels this very deeply and, in bidding farewell to a dear old friend and colleague, rests assured that he will not be held to disparage the many great anæsthetists with whom he has worked when he writes that the greatest of them all has gone.

JAMES ALEXANDER STEPHEN

M.B. ABERD., D.P.H., J.P.

Dr. James Stephen, who died on New Year's Day at the age of 66, was the first officer for maternity and child welfare in Aberdeen. From 1919 until June of last year he was responsible not only for the inception and development of this branch of public health but for its glad acceptance by the poorer mothers of the city. Son of the minister-schoolmaster at St. Andrews - Lhanbryde, Stephen had qualities of kindly and sincere directness and enthusiasm which made him a friend both to innumerable patients and to generations of Aberdeen men to whom he taught his subject. Intensely interested in the more scientific aspects of his work he never allowed this side to cloud his view that common sense, humility and sympathy are the fundamental qualities of the good doctor. After graduating in medicine in 1900 he was appointed assistant in anatomy in the university and during this time he took his public-health diploma. From 1901 to 1914 he carried on a large practice in Elgin, where he was a member of the school board and medical officer for the burghs of Lossiemouth and Burghead, and after serving through the war in France he returned to Aberdeen to his true métier. In the years which followed he played a big part in the eradication of rickets from the area, the halving of the infant mortality-rate from 128 per 1000 births, the establishment of welfare centres in every district in the city, the provision of nursery schools and homes, and the building of the new maternity hospital. With so much executive and routine work Stephen had little time for writing but the report (which became a model) on maternal mortality and puerperal sepsis in Aberdeen from 1918 to 1927, issued by the Scottish Board of Health, was prepared by him and two colleagues. It was in 1917 that Matthew Hay realised the advantages of a routine inquiry into every maternal death and Stephen was among the first to make the detailed records. Other subjects on which he wrote include sudden death in pneumonia, salmonella infections, and the rôle of the maternity hospital in preventive medicine. In 1930 he gave in London the presidential address at the maternity and child welfare group of the Society of M.O.H.'s.

Dr. D. Rorie writes: My friendship with James Stephen dated back to 1914 when he left his Elgin practice to join the 1/2nd Highland Field Ambulance of the 51st Division; and it was cemented during the three years we spent together before he left us to become an O.C. ambulance train. He was by no means a youngster when he took his R.A.M.C., T.F., commission, but he faced up to the subsequent campaigning as a junior officer of the unit with his usual equanimity, even when on one occasion he was sent by corps orders to a C.C.S. with a party of nursing orderlies and found they were detailed to dig drains! But all that fell his way he did cheerfully and well, seeing the funny side of even humourless brass hats, and under the most trying conditions maintaining a placidity of outlook which most of his colleagues frankly envied. When he left us and took to "wheels" all members of the unit, officers and men alike, missed him badly. It was not long after demobilisation that he gave up general practice to become the first maternity and child welfare medical officer in Aberdeen. His innate philanthropy and benevolence, his wide experience of human nature gained in general practice, his tact, his wholesome common sense, and his quaintly detached outlook were all valuable assets in winning through to success. Although he was by then far from physically fit, he did his part in the spadework of last year's annual B.M.A. meeting in Aberdeen, acting as one of the two deputy local secretaries. His family life was a full and happy one. His wife, who shared his professional interests, died shortly before the onset of his own last illness, and it was a loss that he found hard to bear. He leaves two sons, one a captain, R.A.M.C., now serving abroad, the other studying divinity at Aberdeen; and a married daughter living in England.

ARCHIBALD GALBRAITH FAULDS

M.B. GLASG., F.R.F.P.S.

Dr. Faulds, who died last week at Bearsden, Dumbartonshire, was one of the pioneers in radiological work in this country. He was born in 1860 in Glasgow and graduated at Glasgow University in 1888. Four years later he was demonstrator of anatomy in St. Mungo's College, Glasgow, and in 1895 was appointed assistant to the professor of surgery. He became a fellow of the Royal Faculty of Physicians and Surgeons of Glasgow in 1906, and in 1910 he was appointed consulting surgeon to Glasgow corporation. He acted as examiner in physics for the Royal Faculty in Glasgow and for the Royal Colleges of Physicians and Surgeons in Edinburgh. Dr. Faulds was an assistant surgeon in the Glasgow Royal Infirmary for a time and professor of physiology at St. Mungo's College and was a widely popular and respected teacher of surgery, physiology and radiology. To his credit goes the taking of the first X-ray photograph in Scotland, and during his early work in radiology he was associated with the late Dr. John McIntyre. It is only lately that Dr. Faulds retired from private practice in Glasgow.

Dr. WILHELM NEUMANN, late of Baden-Baden, died on Dec. 29 at Leamington, aged 55, a few weeks after settling there with a view to practice in cardiovascular disorders. He was one of the best type of health-

resort practitioners, a close observer both of mental and bodily states, keeping well abreast of advancing knowledge in his subjects, and always courteous, kindly and encouraging. Before the last war he practised in winter at Nervi, studying in Swiss and German clinics in the summer. During that war, in the German military medical service at Baden-Baden, he became interested in hydrological methods, and subsequently settled there as a spa practitioner in rheumatic and circulatory affections. When obliged to leave Germany, he transferred his practice to San Remo. Neumann was a member of the International Society of Medical Hydrology and of the International League against Rheumatism, and the author of numerous papers dealing with tuberculous, rheumatic and circulatory diseases. He leaves a widow and one daughter.

MEDICAL NEWS

Royal College of Surgeons of England

At a meeting of the council held on Jan. 11 with Mr. Hugh Lett, the president, in the chair Sir Humphry Rolleston, chairman of the executive committee of the Imperial Cancer Research Fund since 1924, and Sir Thomas Dunhill, serjeant-surgeon to the King, were admitted to the honorary fellowship. Sir Hugh Devine, president of the Royal Australasian College of Surgeons, has accepted the honorary fellowship.

The Hallet prize, granted on the result of the primary fellowship examination, was awarded to James Grayton Brown, of Melbourne.

The council decided to institute a new series of lectures in physiology and a new series of demonstrations in pathology. Mr. D. H. Patey was elected Erasmus Wilson demonstrator and Mr. Gwynne Williams has agreed to give six demonstrations in pathology before May next. Mr. Arthur Burgess was appointed Hunterian orator for 1941, Sir Alfred Webb-Johnson Bradshaw lecturer for 1940, and Dr. Arnold Chaplin Thomas Vicary lecturer for 1940.

The posts of resident surgical officer and house-surgeon at the Clayton Hospital and Wakefield General Dispensary were recognised for the six months' surgical practice required of candidates for the final examination for the fellowship.

The following diplomas were granted, jointly with the Royal College of Physicians:

D.P.M.—A. L. Abeyewardene, C. D. Amarasinha, G. F. Andrews, P. L. Backus, J. L. Barford, D. R. Davis, P. E. F. Frossard, D. W. T. Harris, A. J. Matheson, A. G. Moore, F. D. Paterson, T. P. Riordan, H. R. Rollin, Alice I. Roughton, A. M. Spencer and R. F. Tredgold.

D.L.O.—J. H. Appleton, Richard Chignell, C. S. David, A. H. Farid, A. T. George, W. C. Gledhill, Maurice O'Regan, D. Y. Richardson, Alexander Russell, H. C. Saksena, and G. S. M. Wilson.

Francis Amory Septennial Prize.

Under the will of the late Francis Amory, the American Academy of Arts and Sciences administers a fund to provide a septennial prize for "conspicuously meritorious work performed through experiment, study or otherwise, in the treatment and cure of diseases and derangement of the human sexual generative organs in general, and more especially for the cure, prevention or relief of the retention of urine, cystitis, prostatitis, etc." during the years preceding the award. If there is work of a quality to warrant it, the first award will be made this year. The total amount of the prize will exceed 10,000 dollars and may be given in one or more awards. While formal nominations are not expected and no essays or treatises in direct competition for the prize are desired, the committee invites suggestions which should reach them, care of the American Academy of Arts and Sciences, 28 Newbury Street, Boston, Mass., U.S.A., not later than May 15. The members of the Francis Amory Fund committee are: Dr. Roger I. Lee (Chairman), Dr. Walter B. Cannon, Dr. David Cheever, Prof. Leigh Hoadley, Dr. William C. Quinby, Dr. E. E. Tyzzer and Dr. Soma Weiss (Secretary).

Service Appointments

Air-Commodore H. E. Whittingham, whose promotion to the acting rank of air vice-marshal we announced last week, has been appointed director of hygiene to the Royal Air Force Medical Services.

Sir Harold Fawcus has been appointed an honorary colonel commandant of the Royal Army Medical Corps.

Colonel A. J. Orenstein has been appointed director-general of medical services with the British East African forces.

London Ambulance Service.

On the outbreak of war the system of dealing with telephone calls for ambulances received by this service was decentralised and a war-time organisation was set up under which calls are dealt with by the control-centres of each metropolitan borough. By arrangement with the London Civil Defence regional headquarters it has now been decided to revert to the peace-time system except for street accident and emergency cases. Applications for ambulances should be made as follows:

For fever or smallpox cases—Call WATerloo 3311.

For street accidents or other emergencies—Dial 999. The caller will then be connected with the ambulance officer at the appropriate borough control-centre who will arrange for the despatch of an ambulance.

For admission to Council's general hospitals. The medical superintendent of the hospital should be informed and the necessary arrangements will be made by him. In cases of extreme urgency application for the ambulance may be made direct to the London Ambulance Service (WATerloo 3311) before communicating with the medical superintendent. A medical certificate that the patient is fit to be moved should be provided in every case.

All other ambulance inquiries, including applications for the hire of ambulances, should be made to WATerloo 3311.

Broadcasts in February.

The Friday talks at 10.30 A.M. on health matters will be continued in February. In the broadcasts to schools the subjects for February on the series, Our Daily Life, by A. D. Peacock and R. G. Garry are: Mackenzie studies the heart (Feb. 7); blood and iron (Feb. 14); strength and force (Feb. 21); and ductless glands (Feb. 28).

Maternity Services in Lanarkshire

It is announced that during the six months to November, 1939, 1308 maternity cases, or 63 per cent. of the mothers in the county confined in their own homes in Lanarkshire, were dealt with under the new maternity service scheme which came into operation last May. This scheme, one of 35 covering 37 of the 55 local authorities in Scotland responsible for maternity services, was started under the Maternity Services (Scotland) Act, 1937, to enable every expectant mother to obtain in her own home, at a reasonable charge, or free if need be, the services of a qualified medical practitioner and midwife. The assistance of a specialist obstetrician can also be obtained for the all-in fee. It is hoped that this service will lead to a valuable reduction in the amount of postpartum morbidity and in the number of deaths. Patients whose family incomes bring them under the national health insurance limit are asked to pay 30*s.* for the all-in service; those with incomes over the limit pay £3 5*s.* These charges, however, are not immutable and may be scaled down where the patient's financial circumstances warrant it. In Lanarkshire 18 out of the 2081 cases booked since the start of the scheme paid the maximum fee of £3 5*s.*, 1753 paid 30*s.*, 193 paid sums varying from 25*s.* downwards and 117 were unable to make any payments. The total cost of the scheme in the county during the six months amounted to £4729, of which more than a third has been returned in patients' fees. Up to now most of the women attended by the service belong to the population insured under the national insurance provisions, but as the service becomes better known larger numbers of women in higher income groups will no doubt take advantage of it. No restriction of the local authority schemes is expected as the result of the war, and it is understood that the Government's intention is to encourage further development not only in Lanarkshire, but throughout the other parts of Scotland. In addition to the 35 schemes already in operation a further 15 are in an advanced stage of preparation.

A War-time Maternity Service

A special maternity service for the wives of junior officers and other ranks of H.M. Forces is to be provided at the Middlesex Hospital. Members of the honorary medical staff have offered to give their services without fee, and accommodation will be provided in small ward units with a curtained cubicle for each patient. The medical and nursing care provided will cover not only the stay in hospital but also the period before the birth of the baby, and supervision of the baby by a children's specialist. The inclusive charge made by the hospital is at present fixed at twenty guineas, which covers any period of stay in hospital, however long. Applications from the wives of officers and other ranks should be made in the first instance to the secretary of the Woolavington Wing, Middlesex Hospital, London, W.1. The service is not available for the wives of officers above the rank of lieutenant in the Navy, captain in the Army or flight-lieutenant in the Air Force.

Sir SAMUEL BRIGHOUSE, who died at Ormskirk on Jan. 15 at the age of 90, had been for over 55 years coroner for the Ormskirk division of Lancashire, where he had conducted 25,000 inquests. He was senior partner in a firm of solicitors founded by himself.

Prof. HANS ZIEMANN, the well-known authority on tropical hygiene, died in December at the age of 74.

Medical Diary

Week beginning Jan. 22

ROYAL SOCIETY OF MEDICINE, Wimpole Street, W.1.

MONDAY
Odontology, 2.30 P.M., Mr. A. W. Wellings: Recent Investigations in Dental Histology.

TUESDAY
Medicine, 2.15 P.M., Dr. W. Burton Wood: Cystic Disease of the Lung.
Pathology, 2.30 P.M., short communications.

THURSDAY
Urology, 2.45 P.M., Mr. John Everidge: Nephro-ureterectomy. (Presidential address.)
Ophthalmology, 4.30 P.M., Mr. M. H. Whiting, Mr. R. E. Bickerton, and Mr. T. J. Phillips: Gas Injuries to the Eye.

FRIDAY
Disease in Children, 2 P.M., Dr. E. Hinden: 1. Marasmus treated by Breast Milk. Mr. D. W. C. Northfield: 2. Cerebral Abscess in a Girl aged 9. Dr. B. M. Zeal: 3. Interlobar Effusion in a Child aged 3. Dr. D. S. Court: 4. Malignant Hypertension in a Child aged 10.

BRITISH POSTGRADUATE MEDICAL SCHOOL, Ducane Road, W.12.

DAILY
10 A.M.–4 P.M., Medical clinics; surgical clinics and operations; obstetrical and gynæcological clinics and operations. 1.30–2 P.M., post-mortem demonstration.

TUESDAY
2.30 P.M., Lord Horder: Ward clinic.

WEDNESDAY
11.30 A.M., Clinico-pathological conference (medical). 2 P.M., Dr. King: Intestinal and pancreatic function. 3 P.M., Clinico-pathological conference (surgical).

THURSDAY
2–4 P.M., Radiological conference. Dr. Duncan White.

FRIDAY
2 P.M., Clinico-pathological conference (gynæcological).

ROYAL COLLEGE OF SURGEONS OF ENGLAND, Lincoln's Inn Fields, W.C.2.

MONDAY.—3 P.M., Mr. Rainsford Mowlem: Use and Behaviour of Cartilage and Bone Transplants. (Hunterian lecture.)

TUESDAY.—3 P.M., Mr. R. Davies-Colley: Tumours of the Bone.

WEDNESDAY.—3 P.M., Mr. Hermon Taylor: Practical Evaluation of Gastroscopy. (Hunterian lecture.)

THURSDAY—3 P.M., Mr. D. H. Patey: Demonstration of the Pathological effects of Trauma.

FRIDAY.—3 P.M., Mr. E. C. B. Butler: Treatment Complications and Late Results of Acute Hæmatogenous Osteomyelitis. (Hunterian lecture.)

EUGENICS SOCIETY

THURSDAY.—3 P.M. (rooms of Linnean Society, Burlington House, Piccadilly, W.1), Mrs. Margery Spring-Rice: Health of Working Women and its Significance in War-time.

TAVISTOCK CLINIC, WESTFIELD COLLEGE, Kidderpore Avenue, N.W.3.

MONDAY.—3 P.M., Dr. E. A. Bennet: The Technique of Analytical Psychology (Jung).

FELLOWSHIP OF MEDICINE & POSTGRADUATE MEDICAL ASSOCIATION, 1, WIMPOLE STREET, W.1.

MONDAY TO SATURDAY.—St. Mary's Hospital, W.2. TUES., WED., and THURS., 8 P.M., F.R.C.S. (Final) clinical and tutorial course. Royal Cancer Hospital, Fulham Road, S.W.3. Daily, 9.30 A.M., F.R.C.S. course. MON., THURS., and FRI., operative surgery course. Royal National Orthopædic Hospital, Brockley Hill, Stanmore. FRI., 2 P.M., orthopædic course. Medical Society of London, 11, Chandos Street, W.1. TUES., 4.30 P.M., Mr. A. E. Porritt: Large Intestine and Rectum. THURS., 4.30 P.M., Mr. A. J. Cokkinis: Treatment of War Injuries.

LONDON JEWISH HOSPITAL MEDICAL SOCIETY

WEDNESDAY
2.15 P.M. (Woburn House, Upper Woburn Place, W.C.1), Dr. Andrew Topping, Mr. Somerville Hastings, Dr. C. L. Batteson, and Mr. J. C. Gilbert: The Future of Organised Medicine.

ASSOCIATION OF INDUSTRIAL MEDICAL OFFICERS.

FRIDAY.—5.30 P.M. (Imperial Hotel, Russell Square, W.C.1). Dr. E. H. Capel and Dr. M. W. Goldblatt: "Some War-time Problems in Industrial Medicine." 8.30, Pre-view of colour film The First Treatment of Industrial Injuries, produced by Messrs. T. J. Smith and Nephew.

Births, Marriages and Deaths

BIRTHS

CAMERON.—On Jan. 10, in Edinburgh, the wife of Dr. E. H. Cameron—a son.

EDHOLM.—On Jan. 11, the wife of Dr. O. G. Edholm—a daughter.

GREEVES.—On Jan. 8, at Taunton, the wife of Major P. R. Greeves, R.A.M.C.—a daughter.

UNGLEY.—On Jan. 3, at Disblair House, Newmachar, Aberdeenshire, the wife of Acting Surgeon Commander C. C. Ungley, F.R.C.P., R.N.V.R.—a daughter.

MARRIAGES

PARK—SELDON.—On Jan. 6, at Streatham Hill, William Douglas Park, M.B., to Beryl Patricia Seldon.

DEATHS

BURTON.—On Jan. 10, at Finchley, Francis Henry Merceron Burton, M.D. Durh., aged 80.

CHARLES.—On Jan. 13, in London, Herbert Charles, M.R.C.S., D.A.

DRINKWATER.—On Dec. 29, at Wrexham, Katharine Rosebery Drinkwater, O.B.E., M.B. Lond.

HOUGHTON.—On Jan. 10, at Bournemouth, Frank Edwin Caulfeild Houghton, M.R.C.S.

HOWELL.—On Jan. 11, Thomas Arthur Ives Howell, M.R.C.S., of Rochampton.

JACKSON.—On Jan. 11, in Winchester, Richard Houlton Jackson, M.R.C.S., of Hampstead, aged 69.

LANGLEY.—On Jan. 13, William Johnson Langley, L.R.C.P.E., of East Sheen.

PARKER.—On Jan. 8, at Southsea, Frederick William Parker, O.B.E., M.R.C.S., surgeon rear-admiral, R.N. (retd.).

SMITH.—On Jan. 9, Ernest Newlyn Smith, M.D. Lond., of Hampstead, aged 72.

TYACKE.—On Jan. 11, at Weymouth, Colonel Nicholas Tyacke, M.R.C.S., R.A.M.C. (retd.).

WHITTOME.—On Jan. 12, Arthur Whittome, F.R.C.S.E., of Brenchley, Kent.

Appointments

ADLINGTON, S. R., M.B. Sheff., resident surgical officer at Doncaster Royal Infirmary.

BAILEY, D. W., B.M. Oxfd, resident surgical officer at the Victoria Memorial Jewish Hospital, Manchester.

CLARKE, E. P., M.B. Lond., resident assistant medical officer at St. Richard's Hospital, Chichester.

HESLOP, T. S., M.B. Manc., F.R.C.S., hon. surgeon for children to the St. Mary's Hospitals, Manchester.

MACDOUGALL, J. L., M.B. Glasg., assistant medical officer at the Royal Eastern Counties Institution, Colchester.

NEWBOLD, J. C., M.B. Camb., house-surgeon to the Chelsea Hospital for Women.

O'FRIEL, A. J., M.B. Belf., casualty officer and fracture house-surgeon at the Chesterfield and North Derbyshire Royal Hospital.

PULVERTAFT, C. N., M.B. Camb., D.M.R.E., medical officer to the X-ray and electro-therapy department of the Royal London Ophthalmic Hospital.

WOOLF, Rowena, M.B. Lond., D.P.H., temporary medical officer in the maternity and child-welfare department at Birmingham.

WYNN-WILLIAMS, George, M.B. Lond., house-surgeon to the Chelsea Hospital for Women.

Middlesex Hospital, London.—The following appointments are announced:

SCADDING, F. H., M.D. Lond., M.R.C.P., acting medical registrar;
EVANS, E. M., M.B. Camb., acting surgical registrar; and
SMITH, Rodney, M.B., F.R.C.S., acting surgical registrar.

Examining surgeon under the Factory Act, 1937: Dr. J. C. LAMONT (Leeds West and Farsley district, Yorkshire).

NOTES, COMMENTS AND ABSTRACTS

RELEASE OF SCHOOL PREMISES USED FOR A.R.P.

IN a circular issued by the Board of Education to local education authorities on Dec. 14, the board urged that the measures taken to promote the cleanliness of school-children should be resumed and intensified in the evacuation areas, and added that the Minister of Home Security would welcome any arrangement whereby the staff and premises of cleansing stations provided for air-raid precautions purposes would be utilised for the cleansing of school-children. The Minister of Health has now requested those councils which are scheme-making authorities under the Air-Raid Precautions Act, 1937, to coöperate to the fullest possible extent with the local education authority in making the facilities at first-aid posts available where necessary for the school health services. Where school clinics, feeding centres or other premises essential for the conduct of the school health services are being used for civil defence purposes, whether in evacuation or in reception areas, he hopes it will be found practicable to secure their total or partial release.

When the responsibility for organising the first-aid post service was transferred from the Home Office to the Ministry of Health, it was suggested that so far as possible posts should be established in existing hospitals and clinics in order to secure the advantage of continuous medical association and possibly of an existing trained personnel. The Minister now points out, however, that it was not intended that the establishment of the posts in clinics should prevent them from being used for the ordinary health services unless there were raids in the vicinity. Where the establishment of a post in a clinic is in fact interrupting the ordinary work, the council is asked to consider what alternative arrangements can be made. In some cases it may be necessary to provide accommodation in which the full-time personnel of the post can be accommodated while sessions are taking place in the clinic. Ordinarily, however, it appears to the Minister quite practicable for joint occupation to be arranged without interfering with the efficiency of either the first-aid post or the clinic. Indeed, he adds, the work of the clinic should provide a useful training for the personnel of the post.

ELECTROSTATIC PRECIPITATION OF DUST AND BACTERIA

NINE-TENTHS of the particles suspended in the air are less than 1 micron in diameter. Pollens range in diameter from 15 to 25 μ; bacteria from 1 to 2 μ; smoke particles average 0·3 μ and tobacco smoke particles 0·1 μ in diameter. The screens and filters used in air-conditioning plants catch only a small proportion of the finer impurities, but these can be effectively removed by electrostatic precipitation. The possibility of cleansing gases by an electrical discharge was discovered 115 years ago, and in the Precipitron, invented in the Westinghouse research laboratories, this method has been simplified and put on a practical and economical basis. The Precipitron is made in two standard sizes, the smaller one being designed to clean 300 to 375 cu. ft. of air per min., the larger one 600 to 750 cu. ft.

In order to remove a dirt particle from the air electrostatically, it must be given an electrical charge and then placed in an electrostatic field with a voltage gradient high enough to attract it out of the air on to a plate where it will stick by its own adhesion. Thus each Precipitron cell consists of two parts, the ionising and the precipitating units. In the ionising chambers the air passes over small wires placed between earthed cylinders. The wires carry a direct current of some 12,000 volts, and act as a kind of electrostatic screen which gives a negative electrical charge to all dust particles passing through it. Next, in the precipitating chambers, the air is carried between a number of closely-spaced parallel plates. Alternate plates are earthed and electrically charged, thus forming another electrostatic screen between the plate systems. As the air passes between the parallel plates, the charged dust particles are deposited on the earthed plates, and in this way 85–90 per cent. of the solid impurities are removed. A small power unit supplies direct current of 12,000 volts for the ionising and of 5,500 volts for the plate section of the Precipitron cell from any electric main.

There are many applications of the Precipitron. Industrial dusts which constitute a hazard to the health of employees or interfere with production processes may be removed. Such dust is often valuable. For example, a West Virginia pottery has installed ten Precipitrons on its automatic glaze-spraying machines to recover excess glaze in suspension in the exhaust air. Each of these precipitators in a 40-hour week collects 800 lb. of glaze, which may be worth as much as $1600. Cleansing the air also protects delicate apparatus such as automatic telephone switching equipment, reduces damage to merchandise, and diminishes cleaning costs of walls, draperies, furniture, and so on. Finally, it is claimed that electrostatic air cleaning will give relief to hay fever and asthma sufferers and will reduce the bacteria content of the atmosphere in operating theatres and hospital wards.

WAR-TIME ALMONRY

THE thirtieth report of the Cicely Northcote Trust is of eleven months of work under conditions of at least nominal peace and of one month under conditions of war. The eleven months are, after one brief paragraph, relegated to the tabular statement at the end of the report, while we hear the tale of last September from the point of view of the almoner. When St. Thomas's was cleared two days before the declaration of war the Northcote trust had to look after patients who had been prematurely discharged, arrange for their journeys, see that a district nurse was available at their homes, and that their families had at least sufficient money to manage. The trust had also to help with the patients, too ill to be discharged, who had to be evacuated to Brighton. During the first weeks of the war it was not easy to arrange medical care for discharged patients during their first weeks at home. Another problem was to find accommodation and nursing for the incurably sick, formerly patients of the hospital, who were now suddenly discharged from the county-council hospitals to which they had been sent. The fathers' and mothers' club which is closely allied with the work of the trust is having an almost embarrassing success on blackout evenings, when youth and age seem content to be served together.

WORLD REQUIREMENTS OF NARCOTIC DRUGS

THE estimates of the world requirements of narcotic drugs for 1940 are set out in a statement compiled by the supervisory body under the Limitation Convention of 1931, and issued by the League of Nations. The gross estimates for the chief narcotic alkaloids are: morphine 43,940 kg., heroin 771 kg., codeine 30,707 kg., Dionin (ethyl-morphine) 2567 kg., and cocaine 4619 kg. It has however to be borne in mind that some 34,000 kg. of the gross amount of morphine are to be used for conversion into codeine, leaving nearly 10,000 kg. for the annual requirement of morphine as such. The estimates for codeine have increased steadily during the last six years, and appear to indicate a tendency to substitute this less stringently controlled alkaloid for morphine. There seems however, to be little doubt that codeine should be regarded as a drug of addiction. Six years' application of the Limitation Convention appear to have brought the manufacture and trade in narcotic drugs

into close accord with what is regarded as legitimate medical and scientific requirements.

In spite of the difficulties encountered by the supervisory body owing to the outbreak of war, the estimates essential for determining and allotting the requirements of the several narcotics for each state have been for the most part forthcoming. They have been duly supplied by no fewer than 65 countries and 98 territories. For the remaining 7 countries and 8 territories the supervisory body has framed appropriate estimates. The experience of the last war has emphasised the urgent need for maintaining unrelaxed international control of commerce in narcotic drugs, and it is the general wish of all governments that the conventions supervised by the League of Nations shall continue.

Statistical tables record the estimates for morphine, heroin, dionin and cocaine for the current year returned by each country. The largest requirements of morphine are from the United States, Germany, Soviet Russia and Japan; of heroin from Japan and Italy, and of cocaine from Japan, the United States, and Soviet Russia. It is remarked that some governments, in view of the international situation, have sought to increase their reserve stocks, notably of morphine.

PAPWORTH SCREENED

Papworth settlement and all it means needs no bush among the congoscenti, but the ordinary man-in-the-cinema will probably realise for the first time the scope of its constructive work when he sees at his local theatre a new two-reel "short" entitled The Gift of Health. As he follows the adventures of Thompson, his hazy concept of a "sort of sanatorium" is replaced by a clear idea of a complete community leading independent but sheltered lives. We see Thompson's medical treatment, we follow him from his bed to the balcony, and from the balcony to a chalet in the grounds. Here as a preparation for a return to normal life Thompson inspects the various workshops and chooses a new trade. We watch him being taught to make leather suit-cases. Medical supervision continues but he moves from the chalet to live at the men's hostel. Later we see him, once more a wage-earner, among his family in one of the villas on the Pendragon estate.

ADRENALINE IN MALARIA

Ascoli's adrenaline therapy of malaria has been tried out on an extensive scale in Italy by Prof. N. Parise,[2] who has treated 511 patients, repatriated from Italian East Africa with malaria, in the following way: 239 by Ascoli's method (with adrenaline injected intravenously and with quinine 1–1·2 g. by mouth daily during fever); 149 with adrenaline alone; and 123 with quinine 0·4–0·8 g. in a single dose administered two or three hours before each intravenous injection of adrenaline, with the idea of making the presence of both drugs in the blood coincide, so that the parasites expelled from the spleen by its contraction due to the adrenaline should be immediately subjected to the action of the quinine. The history of malaria in these patients ranged from six months to two and a half years; consequently the investigation concerned not the primary fever but relapses. The temperature charts of the 239 patients treated by Ascoli's method without modification were so varied that some could be adduced in support of any of the previous evaluations of this treatment—in other words, no generalisation could safely be made. The relapse-rate in the Ascoli-treated patients was 75–80 per cent., whereas in the 149 patients treated with adrenaline alone it was 80–85 per cent. Parise maintains that Ascoli's dosage of quinine is not high enough, especially in view of the fact that in the 123 patients treated by his modification the relapse-rate was only 47 per cent. The contraction and re-expansion of the spleen due to adrenaline are confirmed. The most notable result, however, was the remarkable improvement in the patients' general condition and blood-picture after treatment with adrenaline. This was seen in 87 per cent., no improvement being seen in 11 per cent. and deterioration in 2 per cent. The gain in weight in the improved patients was 6½–24 lb. in thirty-five to forty days.

1. See *Lancet*, 1939, **2**, 943.
2. Parise, N. *Riv. Malariol.* 1939, **18**, 281.

FIRST AID FOR AIR PASSENGERS

In a health manual written for the company staff the medical adviser to Imperial Airways touches lightly upon such matters as medical disorders, accidents and injuries, disorders during flight, care of health in the tropics, sanitary regulations at landing grounds, medical regulations about passengers and insect destruction on aircraft. In two chapters he sets out the medical equipment carried on aircraft or provided at landing grounds. Aircraft engaged on European services carry merely medical haversacks containing a few simple drugs and dressings but including Omnopon in sealed containers. The equipment carried on Empire routes is more elaborate and includes such things as splints, dressings for burns, Elastoplast, Spencer Wills' forceps and snake-bite outfits, though in no great quantity. Landing grounds are divided into three classes, according to size. In classes 1 and 2 a first-aid room is provided; in class 3 equipment is more limited and the quantity of drugs and dressings is reduced by half. Tincture of iodine is still the routine antiseptic employed in the first-aid dressing of wounds, although mercurochrome is at least as efficient and has the additional advantage of being painless when applied to raw surfaces.

CENSORSHIP IN FRANCE

It has been found necessary to draw the attention of the medical profession in France to the restrictions imposed by the war on the publication of the findings of medical research. Last June Professor Gosset suggested that in time of war there should be co-öperation in the medical field not only between allies but between combatants, and he expressed his willingness to coöperate with enemy surgeons for the relief of suffering. The French national health service, however, has reminded the medical profession that every report destined for publication in the medical and lay press, notably scientific communications to learned societies, must be submitted to censorship. Even reports of transactions of the learned societies come under this rule.

DOMESTIC METEOROLOGY

Dr. A. J. Copeland has now carried his observations on the water associated with clothing a step further (see *Lancet* Jan. 6, p. 60). He writes: Water vapour is intimately associated with all our linen and fabrics. It is often unrecognised, especially by the housewife, because the stuffs feel merely cold, and are not damp until warmed. "Airing," unless close to a source of direct heat, does not remove it, and may facilitate its ingress, as when warm dry sheets are exposed to the atmosphere. Materials vary in their affinity for water. For example, if a corduroy waistcoat, having a flannel-lined cloth back, is taken from the wardrobe, the corduroy feels slightly cold, not damp, the other materials feel very cold, but again not damp. When the waistcoat is held before the fire little vapour comes from the corduroy, much from the flannel and cloth. Farmers, gamekeepers and labourers make much use of corduroy, but the housewife clings to her woollies—the blotting-papers of the wardrobe—and knits them for the troops, who are unable to keep them dry. We need quantitative tests to give us units of moisture, standard cloths, possibly kept in vacuo, and comparative coefficients of water-vapour absorption for the standard materials. We could then, using such tests and standards, proceed to what you, Sir, aptly term "Domestic Meteorology." We could investigate laundry, storing-places and living-rooms in various localities, and consider methods of prevention, which must not be costly. The body has to

expel this vapour from the garments, and to do so must lose heat. Heat is wasted, the delicate heat-regulating mechanisms are strained, because the body is "geared" for temperature, and chills are caused. Such chills we know create in the body an environment favourable to morbid reactions and infections. Our objectives, therefore, must be "dry hose, dry hose, as off to work he goes."

THE INFANTS HOSPITAL PHARMACOPŒIA

PROVIDED as he is nowadays with so many vade mecums each more indispensable than the last, the conscientious doctor will shortly be reduced to having a bookcase, preferably an expanding one, fitted to his car or bicycle. The new edition of the "Infants Hospital Pharmacopœia" (1939) bristles with invaluable facts and figures. Clear and concise articles on allergy, basal narcosis, blood-grouping, and the Dangerous Drugs Act are some of its noteworthy features, and the more amnesic among us will be grateful for its tables of normals and ossification. There is a useful note on the postoperative feeding, both natural and artificial, of cases of congenital pyloric stenosis and many will welcome the list of trade-names under which the sulphonamides masquerade. Two newcomers, K and P, join the glorious company of vitamins and the pharmacopœial section includes an entirely new list of oculenta. Throughout there is an admirable paucity of misprints and important omissions, but in the otherwise excellent note on preoperative medication it is surprising that no mention is made of the administration of atropine to children by mouth.

SANATORIUM SERVICE IN GERMANY

Prof. Kurt Klare, whose word carries weight in Germany, has some almost revolutionary remarks to make in a recent number of *Deutsches Tuberkulose-Blatt* on the reorganisation of the German sanatorium services. The growing system of wholesale radiological examinations is yielding a large crop of candidates most urgently in need of sanatorium treatment. For these patients, young adults for the most part, there is not always room enough in the sanatoriums for adults. For it seems to be as difficult in Germany as elsewhere to prevent congestion of sanatoriums by chronic cases and to keep a sufficient number of beds vacant for the acute early case. Professor Klare believes he has found the solution in the children's sanatoriums which have hitherto been filled in large part by the pre-tuberculous child—whatever that may be. He suggests that the inmates of children's sanatoriums should be radiologically sifted in order that the radiologically negative may be sent elsewhere and the sanatoriums reserved for genuine cases, preferably acute and early, of tuberculosis. Such a comb-out would entail, in his opinion, a large-scale exodus with the result that many children's sanatoriums could be converted for the use of adults.

A PREHISTORIC FOOTPRINT

IN prehistoric paintings on rocks in Dutch New Guinea, described by Röder,[1] three principal layers are recognisable, thanks to the habit of painting new subjects on top of old ones. Characteristic of the oldest group (which must be extremely ancient) are silhouettes of hands made by pressing them against the rock and daubing paint all round them, so that the hands stand out as blank spaces. This is one of the commonest forms of painting in the palæolithic age in western Europe and in Africa. Röder's illustration (reproduced here by permission of the editor of *Man*) represents a child's footprint 6 in. long and the print of an adult's hand 9 in. long. There are four striking points about this footprint: (1) an inward curve of the fore part of the foot; (2) abduction of the hallux; (3) isolation of the second toe from the others; and (4) prominences half-way along the medial and lateral borders. The child was almost certainly lifted by an adult for the purpose of placing the foot horizontally against the face of the rock, and this may have exaggerated the normal separation of the hallux and second toe and also made the prominences. This ancient and primitive "sign pedal" confirms statements made in our columns about the feet of children and of primitive races. Thus, James [2] says that the Solomon Islander's footprint shows an adducted fore part, with a lateral prominence over the base of the fifth metatarsal, and occasionally an abducted hallux—all points particularly well illustrated in one of his illustrations. An interesting coincidence is that the aborigines of Dutch New Guinea claim that the artists of the rock paintings were their ancestors and came from the east, and the next important land mass to the east of Dutch New Guinea is the Solomon Islands, where James obtained his material. According to the theory of ontology it is natural to look for primitive traits in a young child. Therefore it is not surprising to learn from Emslie [3] that the footprint of a normal child shows a medial swing of the fore part and separation of the hallux, and she also demonstrates the inward curve of the fore part of the foot in a footprint of an adult and habitually barefoot Scot. Much the same is shown by Lindsay,[4] who shows how the wearing of shoes prevents this natural inward swing, and Sir Arthur Keith [5] has observed that the foot of Coldrum man was more inverted than that of modern adult Europeans.

1. Röder, J., *Man*, November, 1939, p. 175.

HERB DOCTORS IN SOUTH AFRICA

South Africa's country population must still be credulous, for many hundreds of herbalists, or "bossie doctors," still do a flourishing trade. The herb doctor is often a coloured man, with no medical qualification whatever. He has no fixed scale of fees, the convention being that the patients pay what they think the doctor has earned, but as a rule the patients are rather afraid of the man and consequently tend to pay more than they had intended. Faith in these practitioners is strong. There is a lady in a small town in the Transvaal who still believes that being wrapped in the skin of a newly killed cat saved her life when she had typhoid as a child. Most bossie doctors have their secret remedies. Their ointments are made from finely powdered veld herbs mixed with mutton fat or lard and scented with a few drops of essence or aromatic oil. Among the herbs used are "wilde els" (wormwood), "kruisement" (mint), wild garlic and thyme. In many cases the medicine also contains a portion of "Harlem druppels," or "rooi leventel" and certain root extracts to make it more palatable. Tuberculosis is possibly the bossie doctor's largest source of profit, for even enlightened townsfolk still believe they have wonderful herbal cures not known to medical practitioners and

2. James, C. S., *Lancet*, 1939, **2**, 1930.
3. Emslie, M., *Ibid*, p. 1260.
4. Lindsay, E. A., *Ibid*, p. 1211.
5. Keith, A., Antiquity of Man, London, 1925, vol. i.

are often willing to pay large sums for them. One of the Karoo herb doctors prescribes for consumptives a plant which grows in water furrows known as water salad, followed by large quantities of tortoise soup. Karoo bushes like the "geelblom teringtee" and the "rhenoster bos" are often used for this disease, with varying success. Many of the herbs certainly have some medicinal value, the most important being buchu, which grows wild in many parts of South Africa.

The successful bossie doctor needs to know something about herbs and how to give them the authentic dispensary flavour, a few large pots in which to prepare his concoctions and bottles in which to pour them, and a gullible clientele. Most of his medicines are harmless, and in many cases they do benefit the patient, at least through suggestion. The backvelder can often be convinced that the bitter fluid he is told to swallow will do him good, and if it only succeeds in doing this for a month or two the bossie doctor will feel that his skill has been vindicated.

AN APPEAL FOR EVACUEES

THE National Council for Maternity and Child Welfare has issued an appeal for funds on behalf of expectant mothers and children under five. The dispersal of mothers and children from the danger zones of our cities has brought out, in a forcible manner, the urgent need for clothing of all kinds for many of the evacuees owing to changed conditions of life and for comforts for mothers in the emergency maternity hospitals, and the council is receiving many applications for help and advice. It is known that a vast amount of voluntary aid is at present unused because, while many people are anxious to give service in making garments they are held back by lack of money with which to purchase materials. This is particularly the case with many women's organisations and working parties throughout the country. Money received will be spent in buying materials at as low a cost as possible with the help of the Personal Service League. The distribution of garments will be made in consultation with local maternity and child-welfare authorities or responsible local organisations. Contributions should be sent to the hon. treasurer of the council, Carnegie House, 117 Piccadilly, London, W.1. The appeal is signed by Sir Bruce Bruce-Porter, M.D., Dame Louise McIlroy, M.D., Lady Cynthia Colville, Mr. Reginald Garratt, Miss Margaret Bondfield, and Mrs. Sydney Marsham.

DIARY

BAYER'S Medical Diary and Therapeutic Index for 1940 is a leather-bound pocket-size volume compact with information. It includes an alphabetical list of Bayer products, with their uses and properties, suggestions for the treatment of many diseases and symptoms, and much other material of general medical interest. Pages for brief notes of appointments follow and then there are the usual blank pages of the detachable quarterly diary. Most doctors, we fancy, will be prepared to take the risk of becoming too exclusively Bayer conscious entailed by the possession of this vade mecum.

WHO'S WHO—Tinker, tailor, soldier, sailor, rich man, poor man, apothecary, sweep—Who's Who is perhaps not quite as catholic as the plumstones, but it throws its net wide and we find, for instance, Joachim von Ribbentrop cheek by jowl with Colonel William Riach, M.D. The new 1940 edition of this reference book[1] is a miracle of compression. It contains some 40,000 autobiographies of which over 1000 are new, yet its middle-aged spread is not too pronounced and it can still be handled easily.

The offices of the Hampstead Public Health Department have been removed from the town hall to 33/35, Lancaster Grove, N.W.3.

1. London: Adam and Charles Black. Pp. 3532. 63*s*.

Vacancies

Barking Borough.—Deputy M.O.H. and deputy school M.O., £725.

Barry Accident and Surgical Hosp.—Res. surg. O., £350.

Bedford County Hosp.—Second H.S., at rate of £150.

Benenden, Kent, National Sanatorium.—H.P., at rate of £150.

Birmingham City.—Two asst. school M.O.'s, £500.

Birmingham United Hosp.—Registrar to ear, nose, and throat dept., £150.

Bradford Royal Infirmary.—H.S.'s, each at rate of £150. Also Res. surg. O., £250.

Brighton, Royal Alexandra Hosp. for Sick Children.—H.S., at rate of £150.

Bristol General Hosp.—Cas. H.S., at rate of £100. H.P.'s, H.S.'s. Also res. obstet. O., each at rate of £80. Also Temp. res. surg. O. and registrar, £200.

Bristol Royal Infirmary.—Res. med. appts., at rate of £150–£80.

Bristol University.—Lecturer in dental prosthesis, £500.

Bristol, Walker Dunbar Private Hosp., &c.—Vacancy on medical staff.

*British Postgraduate Medical School, Ducane Road, W.*12.—Temp. first asst. in surgical unit.

Cambridge, Addenbrooke's Hosp.—H.S., and res. anæsthetist and emergency officer, each at rate of £130.

Chester Royal Infirmary.—H.S. to orthopædic dept., £150.

Coventry City.—Temp. asst. school M.O. and asst. M.O.H., £600.

Dorchester, Dorset County Hosp.—H.S., at rate of £150.

Dover, Royal Victoria Hosp.—Res. M.O., £140.

Durham, Richard Murray Hosp., Blackhill.—H.S., £200.

Grimsby and District Hosp.—Res. H.P. also res. anæsthetist and jun. house officer, each at rate of £175.

*Hostel of St. Luke, 14, Fitzroy Square, W.*1.—Res. M.O., at rate of £200.

Liverpool Heart Hosp., 34, Oxford Street.—H.P., at rate of £100.

London County Council.—Temp. asst. M.O.'s, £350 and £250 respectively.

Manchester, Ancoats Hosp.—Two H.S.'s, each at rate of £100.

Manchester City.—M.O. for maternity and child welfare, £600.

Manchester, Crumpsall Hosp.—Res. asst. M.O., £200.

Manchester Royal Children's Hosp., Pendlebury.—Res. surg. O., at rate of £150.

Manchester Royal Eye Hosp.—Jun. H.S., £120.

Manchester Royal Infirmary.—Chief asst. to a surgical unit, £250.

*National Dental Hosp., Great Portland Street, W.*1.—Hon. clin. asst. in X-ray dept.

Newcastle upon Tyne, Royal Victoria Infirmary.—Temp. med. reg., £250.

Oldham County Borough.—Deputy M.O.H. and asst. tuber. O. £750.

Oxford, Wingfield-Morris Orthopædic Hosp., Headington.—Lord Nuffield scholarship in orthopædic surgery, £200.

Plymouth, Prince of Wales's Hosp., Greenbank Road.—H.S., at rate of £120.

Royal College of Physicians.—Milroy lecturer.

*Royal Free Hosp., Gray's Inn Road, W.C.*1.—Hon. asst. surgeon to orthopædic dept. Also hon. asst. surgeon to ophth. dept. Also Hon. obstet. surgeon. Hon. asst. obstet. surgeon. Also asst. med. reg., £200.

Royal National Orthopædic Hosp.—Res. surg. and med. supt., at rate of £1250.

*Saint Mary's Hosp. for Women and Children, Plaistow, E.*13.—Res. H.P., at rate of £150.

Southampton, Royal South Hants and Southampton Hosp.—Res. anæsthetist. Also H.P., each at rate of £150.

Stepney Metropolitan Borough.—Asst. tuber. O. and asst. M.O.H., £600.

Surrey County Council.—Two asst. M.O.'s, each £600.

Swansea General and Eye Hosp.—Res. anæsthetist, at rate of £150.

Swansea, Hill House Isolation Hosp.—Res. M.O., £200.

Taunton Borough.—Temp. asst. school M.O. and asst. M.O.H., £500.

Wandsworth Metropolitan Borough.—Temp. asst. M.O.H., and asst. tub. O., £600.

West Ham County Borough.—Jun. asst., M.O. for Plaistow Hosp., £300.

Wolverhampton Royal Hosp.—Cas. O., at rate of £100. Also Res. surg. O., £200.

Wolverhampton and Midland Counties Eye Infirmary.—H.S., £150.

The Chief Inspector of Factories announces vacancies for examining surgeons at Shettleston, Lanark; Hungerford, Berks; and Erdington (Birmingham), Warwick.

Corrigendum.—On page 88 of our issue of Jan. 13, the footnote reference to Dr. W. S. Tegner's survey should read: *Ann. rheum. Dis.* October, 1939.